GUY ARCHITECTS

# QANP Office Renovation

## Project # PW-20-00931760

Parks Canada Agency
Resolute Bay, NU

## Issued for Tender
## Specification Package, Rev. 1

Submitted: November 18, 2022

## 1 GENERAL

### 1.01 NOT USED

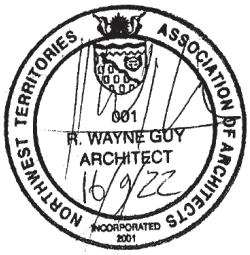
## 2 PRODUCTS

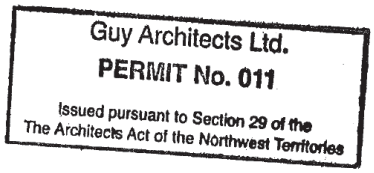
### 2.01 NOT USED

## 3 EXECUTION

### 3.01 SEALS

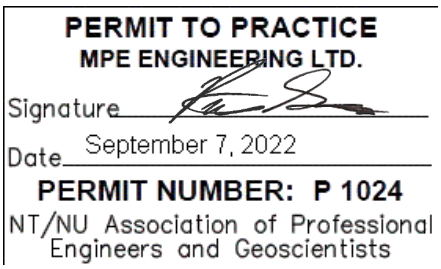
.1 Architectural Stamp covers Division 00 to Division 02/Division 6 to Division 9



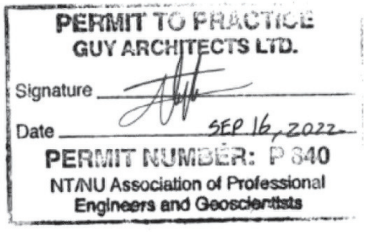




.2 Mechanical Stamp covers Division 21 to 23


September 7, 2022




.4 Structural/Civil Stamp covers Division 31


**END OF SECTION**

**DIVISION 22 – PLUMBING**



**DIVISION 23 – HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)**



**DIVISION 26 ELECTRICAL**

**END OF SECTION**

**1 ARCHITECTURAL DRAWINGS**

- A000 Cover & Code Matrix
- A100 Site Plans
- A101 Existing/Demo Plans
- A102 Existing/Demo Reflected Ceiling Plans
- A103 New Floor Plans
- A104 Crawl Space and Roof Plan
- A105 New Reflected Ceiling Plans
- A201 Elevations
- A301 Building Section
- A302 Building Section
- A401 Interior Elevations
- A402 Kitchen Plan & Elevations
- A501 Plan Details
- A600 Section Details
- A601 Section Details
- A602 Section Details
- A603 Section Details
- A604 Section Details
- A605 Section Details
- A701 Stair Plans & Details
- A702 Ramp Details
- A801 Window & Door Schedules
- A802 Flashing Schedule & Finish Schedule
- A803 Finish Plan & Colour Board
- A804 Siding Elevations

**2 STRUCTURAL DRAWINGS**

- S100 Notes
- S101 Framing Plan
- S102 Framing Plan
- S103 Details

**3 MECHANICAL DRAWINGS**

- M001 General Notes
- M101 Existing/Demo Plans
- M201 New Ground Floor Plan – HVAC
- M202 New Second Floor Plan – HVAC
- M203 New Ground Floor Plan – Domestic and Sanitary
- M301 Details and Schematics
- M302 Details
- M401 Schedules
- M402 Schedules

**4 ELECTRICAL DRAWINGS**

- **E100 Specifications Notes & Instructions**
- **E200 Legend Electrical Site Plan**
- **E300 Service-Generator Distribution Schematic**
- **E400 Main Floor Plan Lighting Layout**
- **E401 Main Floor Plan Electrical Layout**
- **E402 Main Floor Plan Mechanical Equipment Location Layout**
- **E403 Main Floor Plan Lighting Demolition**
- **E500 2nd Floor Plan Lighting Layout**
- **E501 2nd Floor Plan Electrical Layout**
- **E502 2nd Floor Plan Lighting Demolition**
- **E600 Electrical Panel Schedules**
- **E601 Mechanical Equipment List**

**END OF SECTION**

# 1 GENERAL

## 1.01 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the provision of all construction, labour and materials, demolition, equipment and temporary facilities and all other goods and services required to complete the Parks Office Renovation located in Resolute Bay, NU in conformance with the Contract Documents.

.2 The Work is not limited to work within the limits of the site but includes all work required by the Contract Documents both within and outside the area of work.

.3 The overall scope of work is outlined in specifications and drawings. Material price to be broken out separately as per the following schedule. All materials and labour required to complete scope to be accounted for in price breakdown:

**Price A, Base Price Fee**: the below items are to be included in the contractor's base scope of work:

| General Items |
|---|
| Contractor to provide pricing for all general requirements for the base scope noted in this project. This is to include the following items:<br>a) Shop Drawings, Samples.<br>b) Permits.<br>c) Mobilization.<br>d) Foundation<br>e) Sea Lifting of Materials<br>f) Framing<br>g) Interior Architecture (Walls, Floors and Ceiling).<br>h) Lighting.<br>i) Electrical.<br>j) Piping.<br>k) Controls.<br>l) Heating and Ventilating<br>m) Fire Suppression<br>n) Testing and Commissioning.<br>o) Supplied equipment long delivery items.<br>p) Engineer supplied equipment required dates. |
| Architectural Items: |
| a) New windows and doors as noted, inclusive of their respective flashing<br>b) New wall and ceiling finishes where noted, including exterior siding<br>c) New partitions<br>d) New stairs, interior & exterior<br>e) New roofing over building additions inclusive of flashing<br>f) New ground floor kitchen appliances, and replacement of second floor kitchen appliances<br>g) New ground floor washer and dryer |
| Structural Items |
| a) Relevel house and provide additional structure for floor & roof support<br>b) Provide new framing & support for new stair opening & roof penetrations |
| Mechanical Items: |
| a) Updated furnace, new HRV & ductwork<br>b) New oil tank & pad |

| Electrical Items |
|---|
| a) New emergency lighting and exit signage<br>b) New generator<br>c) New electrical panel<br>d) New interior lighting<br>e) New receptacles & data |

**Price B, Additional items:** The below items may be added to the contractor's scope of work once total fees are established:

| General Items |
|---|
| Contractor to provide pricing for all general requirements for the additional scope noted in this project. This is to include the following items:<br>a) Award<br>b) Shop Drawings, Samples.<br>c) Permits.<br>d) Mobilization.<br>e) Foundation<br>f) Sea Lifting of Materials<br>g) Framing<br>h) Lighting.<br>i) Electrical.<br>j) Testing and Commissioning.<br>k) Supplied equipment long delivery items.<br>l) Engineer supplied equipment required dates |
| Architectural Items: |
| a) New standing seam roof inclusive of roof flashing & snow guard over existing roof |

All miscellaneous items not specifically noted in the above breakdown but noted in the construction documents are to be included in this price breakdown.

## 1.02 GENERAL

.1 Drawings and specifications are complimentary each to the other and what is called for by one shall be binding as if called for by both.

.2 In case of discrepancies between the drawings and specifications, the specifications will take precedence.

## 1.03 WORK BY OTHERS

.1 Not used

## 1.04 CONTRACTOR USE OF PREMISES

.1 Unrestricted use of site until Substantial Performance.

.2 Check means of access to and egress from the site and any rights and interests which may be interfered with in the course of the work. Do not block roadways, entrances or exits. Coordinate vehicle and material access to site with Departmental Representative.

.3 Co-ordinate use of premises under direction of Departmental Representative.

.4 The boundaries of the site are shown on the Drawings. Should additional areas be required for the storage of materials and/or equipment, the Contractor shall obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.5 Before the commencement of the work, the Contractor shall agree with the Departmental Representative on mutually satisfactory location for material storage.

## 1.05 OWNER FURNISHED ITEMS

.1 Contractor Responsibilities:
- .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Departmental Representative.
- .2 Deliver supplier's bill of materials to Departmental Representative.
- .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
- .4 Arrange for replacement of damaged, defective or missing items.
- .5 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Departmental Representative.
- .6 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
- .7 Receive and unload products at site.
- .8 Handle products at site, including uncrating and storage.
- .9 Protect products from damage, and from exposure to elements.
- .10 Assemble, install, connect, and finish products. Carry out test for the systems to work as intended; configure, balance, and commission these systems.
- .11 Provide installation inspections required by public authorities.
- .12 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .13 Sort and manage work waste and disposed equipment as per local regulations and requirements.

## 1.06 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:
- .1 Construction Contract
- .2 Contract Drawings.
- .3 Specifications.
- .4 Addenda.
- .5 Reviewed Shop Drawings.
- .6 List of Outstanding Shop Drawings.
- .7 Change Orders.
- .8 Other Modifications to Contract.
- .9 Field Test Reports.
- .10 Copy of Approved Work Schedule.
- .11 Health and Safety Plan and Other Safety Related Documents.
- .12 Other documents as specified.

**END OF SECTION**

## 1 GENERAL

### 1.01 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

### 1.02 USE OF SITE AND FACILITIES

.1 No occupants of the building will be onsite during the construction of this building. Contractor to make arrangements with Departmental Representative to facilitate where needed.

.2 Maintain existing services to building.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 The existing washroom facilities may be used throughout construction. Contractor to keep facilities clean. Contractor to provide additional sanitary facilities for own workforce when needed.

.5 Closures: protect work temporarily until permanent enclosures are completed.

### 1.03 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

## 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

## 3 EXECUTION

### 3.01 NOT USED

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, expected cost, and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five (5) day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

## 1.02 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

## 1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit Project Schedule to Departmental Representative within five (5) working days of receipt of acceptance of Master Plan.

## 1.04 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.
- .1 Excavation completed as noted on approved construction schedule.
- .2 Substructure completed as noted on approved construction schedule.
- .3 Superstructure completed as noted on approved construction schedule.
- .4 Building closed-in and weatherproofed completed as noted on approved construction schedule.
- .5 Interior finishing and fitting, mechanical, and electrical work completed as noted on approved construction schedule.
- .6 Interim Certificate (Substantial Completion) as noted on approved construction schedule.

## 1.05 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within five (5) working days.

.3 Revise impractical schedule and resubmit within five (5) working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

## 1.06 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
- .1 Award.
- .2 Shop Drawings, Samples.
- .3 Permits.
- .4 Mobilization.
- .5 Foundation
- .6 Sea Lift
- .7 Framing
- .8 Siding and Roofing.
- .9 Interior Architecture (Walls, Floors and Ceiling).
- .10 Plumbing.
- .11 Lighting.
- .12 Electrical.
- .13 Piping.
- .14 Controls.
- .15 Heating, Ventilating, and Air Conditioning.
- .16 Fire Suppression
- .17 Testing and Commissioning.
- .18 Supplied equipment long delivery items.
- .19 Engineer supplied equipment required dates.

.2 Ensure sufficient time for review of submittals, five (5) working days, is included in the GANTT chart to ensure delays do not occur

**1.07 PROJECT SCHEDULE REPORTING**

.1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

**1.08 PROJECT MEETINGS**

.1 By-weekly meetings between the Departmental Representative and the Contractor will take place throughout the duration of construction via teleconference. These will be minuted by the Contractor.

.2 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.3 Weather related delays with their remedial measures will be discussed and negotiated.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not used.

**END OF SECTION**

# 1 GENERAL

## 1.01 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative’s review.

.10 Keep one reviewed copy of each submission on site.

.11 If directed by Departmental Representative, make submissions by prepaid transmission to:

Guy Architects
P.O. Box 1136, 3528 McDonald Drive
Yellowknife, NT X1A 2N8
Attn: Lucas Meyer, Project Manager, Architectural Tech
(P): (867) 873-3266

## 1.02 CONSTRUCTION SCHEDULE

.1 Immediately after the award of Contract, prepare a draft construction schedule for the work of the entire Contract.

.2 Schedule format:

- .1 Provide horizontal bar chart for each trade or operation.
- .2 Provide horizontal time scale identifying the 1st work day each week.
- .3 Indicate progress of each activity to date of schedule submission.

.3 Show in schedule, start and completion times of each item of the Work including mobilization and erection and dismantling and demobilization of temporary facilities.

.4 Distribute draft schedule to subcontractors. Recipients shall respond to the draft schedule to the Contractor in time to allow submission of the schedule by the specified time.

.5 Incorporate commentaries from subcontractors as appropriate and submit three (3) copies for review no later than 14 days after the award of Contract.

.6 Review Departmental Representative's commentary with sub-trades and incorporate comments as appropriate and resubmit within 7 days and until accepted.

.7 Include with schedule, cash flow chart broken down on a monthly basis. Cash flow chart shall indicate the Contractor's anticipated monthly progress billing from commencement of the Work until completion.

.8 At least once per progress claim period, review construction schedule and notify Departmental Representative of any actual or anticipated delays and recommend actions to recover lost time.

.9 In a manner and at times satisfactory to Departmental Representative, update schedule and cash flow chart whenever changes occur.

## 1.03 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach, or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow five (5) business days for Departmental Representative 's review of each submission.

.4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.6 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:

.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.8 After Departmental Representative's review, distribute copies.

.9 Submit pdf electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.10 Submit pdf electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.12 Submit PDF electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.13 Submit pdf electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.14 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.15 Delete information not applicable to project.

.16 Supplement standard information to provide details applicable to project.

.17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

**1.04 SAMPLES**

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

**1.05 PHOTOGRAPHIC DOCUMENTATION**

.1 Submit electronic copy of colour digital photography in standard resolution as directed by Departmental Representative.

**1.06 CERTIFICATES AND TRANSCRIPTS**

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Northwest Territories and Nunavut
- .1 Safety Act, R.S.N.W.T. - Updated 2016.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
- .1 Results of site specific safety hazard assessment.
- .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.

.4 Submit copies of reports or directions issued by Federal, and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets as required by Departmental Representative.

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.

.8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

## 1.03 FILING OF NOTICE

.1 File Notice of Project with Territorial authorities prior to beginning of Work.

.2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

## 1.04 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

## 1.05 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

## 1.06 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

## 1.07 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

## 1.08 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, territorial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## 1.09 COMPLIANCE REQUIREMENTS

.1 Comply with Safety Act, General Safety Regulations, R.S.N.W.T. 1988,c.S-1.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

## 1.10 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Territory having jurisdiction and advise Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Territory having jurisdiction and advise Departmental Representative verbally and in writing.

## 1.11 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
- .1 Have site-related working experience.
- .2 Have working knowledge of occupational safety and health regulations.
- .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

## 1.12 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Territory having jurisdiction, and in consultation with Departmental Representative.

## 1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

## 1.14 BLASTING

.1 Blasting or other use of explosives is not permitted.

## 1.15 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

## 1.16 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

# 2 PRODUCTS

## 2.01 NOT USED

.1 Not used.

## 3 EXECUTION

### 3.01 NOT USED

.1 Not used.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:
- .1 Contract documents.
- .2 Specified standards, codes and referenced documents.

.3 Comply with all laws, ordinances, codes, orders, regulations, rules and other requirements of territorial, local and other authorities having jurisdiction which are in force during the performance of the Work and which govern the Work, public health and safety, construction safety or any other aspect of the Work. In any case of conflict or discrepancy, the more stringent requirements shall apply.

.4 Where it is necessary to carry out work outside property lines, comply with applicable requirements of local Authorities having jurisdiction.

.5 Promptly submit written notice to the Departmental Representative of observed variance of Contract Documents from requirements of the Building Code and Authorities having jurisdiction. Assume responsibility for work known to be contrary to such requirements and performed without notifying the Departmental Representative.

.6 Pay for and obtain all permits required prior to construction.

## 1.02 NOTICES

.1 Give all required notices and otherwise comply with all procedures required by the regulatory requirements.

## 1.03 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.

.3 Mold: stop work immediately when material resembling mold is encountered during demolition work. Notify Departmental Representative.

## 1.04 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted on federal properties.

**1.05 W.H.M.I.S.**

.1 Carry out all work in accordance with the requirements of the Workplace Hazardous Materials Information System.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 INSPECTION

.1 Allow Departmental Representative or its designate access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give five (5) days' notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work. Submit test results as described in Section 01 33 00.

.4 Departmental Representative will order part of work to be examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

## 1.02 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. These inspections will be completed through photographs and video calls as required, Contractor to facilitate as required.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no additional cost. Pay costs for retesting and re-inspection.

## 1.03 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

## 1.04 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.05 REJECTED WORK**

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative, it is not expedient to correct defective work or work not performed in accordance with Contract Documents, the Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be recommended by Departmental Representative and determined by the Departmental Representative.

**1.06 REPORTS**

.1 Submit three (3) copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

**1.07 TESTS AND MIX DESIGNS**

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

**1.08 MILL TESTS**

.1 Submit mill test certificates as required of specification Sections.

**1.09 EQUIPMENT AND SYSTEMS**

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment–systems.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

## 1.02 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

## 1.03 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

## 1.04 WATER SUPPLY

.1 Provide continuous supply of potable water for construction use when existing facilities are not usable.

.2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

.3 Pay for utility charges at prevailing rates.

## 1.05 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:
- .1 Facilitate progress of Work.
- .2 Protect Work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:
- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace any devices used in the filtration system.

.8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Client Representative.

.9 Pay costs for maintaining temporary heat, when using permanent heating system. Client Representative will pay utility charges when temporary heat source is existing building equipment.

.10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform with applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

## 1.06 TEMPORARY POWER AND LIGHT

.1 Departmental Representative provide and pay for temporary power during construction for temporary lighting and operating of power tools.

.2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.3 Existing lighting may be used for the duration of the Work.

.4 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.5 Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.

.6 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Hamlet Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

## 1.07 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax, video conference, and data hook up, lines and equipment necessary for own use and use, as may be required.

## 1.08 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

## 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

## 3 EXECUTION

### 3.01 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1.59-[97], Alkyd Exterior Gloss Enamel.
- .2 CAN/CGSB 1.189-[00], Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)
- .1 CSA-O121-[M1978(R2003)], Douglas Fir Plywood.

.3 Public Works Government Services Canada (PSPC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

## 1.02 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

## 1.03 HOARDING

.1 Erect temporary site enclosures using construction grade lumber framing and exterior grade fir plywood to CSA O121.

.2 Apply plywood panels vertically as indicated.

.3 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.

.4 Alternatively, erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m o.c. Maintain fence in good repair.

.5 Provide and at least one pedestrian door as directed. Equip door with locks and keys.

## 1.04 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

## 1.05 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

**1.06 DUST TIGHT SCREENS**

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

**1.07 ACCESS TO SITE**

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.08 PUBLIC TRAFFIC FLOW**

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.09 FIRE ROUTES**

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

.1 Protect surrounding private and public property from damage during performance of work.

.2 Be responsible for damage incurred.

**1.11 PROTECTION OF BUILDING FINISHES**

.1 Provide protection for finished and partially finished building finishes and equipment during performance of work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule five (5) days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

**2 PRODUCTS**

**2.01 NOT USED**

**3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specified date or issue is specifically noted.

.2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.3 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

## 1.02 QUALITY

.1 Products, materials, equipment and articles incorporated in work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 In accordance to the Nunavut agreement and contract documents, make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

## 1.03 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work.

.2 In event of failure to notify Departmental Representative at commencement of work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

## 1.04 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

## 1.05 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of work.

## 1.06 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

## 1.07 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

## 1.08 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

## 1.09 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

## 1.10 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

## 1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

## 1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected Specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

## 1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.14 PROTECTION OF WORK IN PROGRESS**

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

**1.15 EXISTING UTILITIES**

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**2 PRODUCTS**

**2.01 ACCEPTABLE PRODUCTS/MATERIALS**

.1 Acceptable Products/Materials means, those items named and specified by prescriptive or performance, meet the specification in all respects and are acceptable to the Departmental Representative, unless named by manufacturer.

**2.02 NO SUBSTITUTIONS**

.1 All products listed as no substitutions in various sections are to be supplied as specified.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:
- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

## 1.02 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

## 1.03 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

## 1.04 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 – Firestopping, full thickness of the construction element.

.13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

## 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

## 3 EXECUTION

### 3.01 NOT USED

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling where applicable according to local bylaws.

.6 Dispose of waste materials and debris at designated dumping areas off site.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered containers certified to hold volatile material, and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.12 Clear snow and ice from access to building, bank/pile snow in designated areas only.

## 1.02 FINAL CLEANING

.1 When work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris to render the site clean and clear.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs, gutters, areaways, and sunken wells.

.16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.17 Clean roofs, downspouts, and drainage systems.

.18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.19 Remove snow and ice from access to building.

## 2 PRODUCTS

### 2.01 NOT USED

.1 Not Used.

## 3 EXECUTION

### 3.01 NOT USED

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
- .1 Contractor's Inspection: Contractor: conduct inspection of work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request Departmental Representative inspection.
- .2 Departmental Representative's Inspection:
  - .1 Departmental Representative and Contractor to inspect work and identify defects and deficiencies.
  - .2 Contractor to correct work as directed.
- .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
  - .1 Work: completed and inspected for compliance with Contract Documents.
  - .2 Defects: corrected and deficiencies completed.
  - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
  - .4 Certificates required by Fire Commissioner and Utility companies: submitted.
  - .5 Operation of systems: demonstrated to Departmental Representative's personnel.
  - .6 Work: complete and ready for final inspection.
- .4 Final Inspection:
  - .1 When completion tasks are done, request final inspection of work by Departmental Representative and Contractor.
  - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
  - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
  - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

## 1.04 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
- .1 Remove surplus materials, excess materials, rubbish, tools and equipment. 2 PRODUCTS

## 2.01 NOT USED

.1 Not Used.

## 3 EXECUTION

### 3.01 NOT USED

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.01 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:
- .1 Departmental Representative to establish communication procedures for:
  - .1 Notifying construction warranty defects.
  - .2 Determine priorities for type of defects.
  - .3 Determine reasonable response time.
- .2 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .3 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four (4) final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

## 1.03 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.
- .1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.
- .1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on CD/USB.

## 1.04 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
- .1 Date of submission; names.

.2 Addresses, and telephone numbers of the Departmental Representative and Contractor with name of responsible parties.
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

## 1.05 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.
.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.
.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

## 1.06 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings and in copy of Project Manual, provided by Departmental Representative.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

## 1.07 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.
.1 Give function, normal operation characteristics and limiting conditions.
.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
.1 Include regulation, control, stopping, shut-down, and emergency instructions.
.2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control

.15 Provide manufacture disposal and recycling guidelines and requirements.

.16 Additional requirements: as specified in individual specification sections.

## 1.08 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

## 1.09 MAINTENANCE MATERIALS

.1 Spare Parts:
- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.–
  - .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:
- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

.3 Special Tools:
- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.

## 1.10 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

## 1.11 WARRANTIES AND BONDS

.1 Provide warranties or bond for Contractor and equipment.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Provide detailed instruction of the procedures required to serve notice of required action under the warranty.

.4 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

## 1.12 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:
- .1 Type of product/material.
- .2 Model number.
- .3 Serial number.
- .4 Contract number.
- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

## 2 PRODUCTS, NOT USED

## 3 EXECUTION, NOT USED

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 CSA International
- .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Research Council Canada (NRC)
- .1 National Building Code of Canada 2015 (NBC).
- .2 National Fire Code of Canada 2015 (NFC).

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

## 1.03 SITE CONDITIONS

.1 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
- .1 Proceed only after receipt of written instructions have been received from Departmental Representative.

.2 The Contractor is not to use any power tools to puncture the existing tile so the existing chrysotile in the tile adhesive is not released during construction.

.3 Notify Departmental Representative before disrupting building access or services.

# 2 PRODUCTS

## 2.01 NOT USED

.1 Not used.

# 3 EXECUTION

## 3.01 EXAMINATION

.1 Inspect building site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain.

## 3.02 PREPARATION

.1 Protection of In-Place Conditions:
- .1 Prevent movement, settlement, or damage to adjacent parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to occupants to minimum.
- .3 Protect building systems, services, and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.2 Demolition/Removal:
- .1 Remove items as indicated.
- .2 Remove parts of existing building to permit new construction.
- .3 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.
- .4 Take all waste to landfill at contractor cost.

## 3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
- .1 ANSI A208.1-09, Particleboard.
- .2 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.

.2 ASTM International
- .1 ASTM E 1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- .2 ASTM D 2832-92(R2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .3 ASTM D 5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
- .1 Architectural Woodwork Standards (AWS).
  - .1 AWS Manual - (2014)

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.5 CSA International
- .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05 (R2009), Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-M1980 (R2008), Poplar Plywood.
- .7 CAN/CSA-Z809-08, Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.8 National Electrical Manufacturers Association (NEMA)
- .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 1.03 - Shop Drawings and Product Data.

.2 Indicate details of construction, profiles, joining, fastening and other related details:
.1 Scale: Profiles full size, details 1/2 full size.

.3 Indicate all materials, thickness, finishes and hardware.

.4 Indicate locations of all service outlets in casework, typical and special installation conditions and all connections, attachments, anchorage, and location of exposed fastenings.

.4 Samples:
.1 Not Required

## 1.03 QUALITY ASSURANCE

.1 Work in accordance with Grade or Grades specified of the AWS.

.2 Woodwork Manufacturer Qualifications:
.1 Member in Good Standing of AWMAC.
.2 Minimum 5 years of production experience similar to this project, whose qualifications indicate ability to comply with requirements of this Section.
.3 Minimum one project in past 5 years where value of woodwork within 20 percent of cost of woodwork for this Project.

.3 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.4 Sustainable Standards Certification:
.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

.5 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery of architectural millwork made only when area of operation enclosed, plaster and concrete work dry and area broom clean.

.3 Storage and Handling Requirements:
.1 Store materials in accordance with temperature and humidity range recommendations by the AWS in clean, dry, well-ventilated area.
.2 Store and protect architectural woodwork from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

## 2 PRODUCTS

### 2.01 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content in accordance with following standards:
- .1 CAN/CSA-Z809 or FSC or SFI certified.
- .2 AWMAC premium grade, moisture content as specified.
- .3 NLGA Standard Grading Rules for Canadian Lumber, 1987.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Hardwood lumber: moisture content 8% or less in accordance with following standards:
- .1 CAN/CSA-Z809 or FSC or SFI certified.
- .2 AWMAC premium grade, moisture content as specified.
- .3 National Hardwood Lumber Association (NHLA), January 1982.

.4 Douglas fir plywood (DFP): to CSA O121, standard construction, CAN/CSA-Z809 or FSC or SFI certified.
- .1 Plywood resin to contain no added urea-formaldehyde.

.5 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m$^3$, CAN/CSA-Z809 or FSC or SFI certified.
- .1 Medium density fibreboard performance requirements to: ANSI A208.2.
- .2 MDF resin to contain no added urea-formaldehyde.

.6 Thermofused Melamine: to NEMA LD3 Grade LPDL.
- .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).

.7 Laminated plastic for postforming work: to NEMA LD3, Grade VGP.

.8 Thermofoil finish on door and drawer fronts. Thermofoil doors are vinyl-coated, thermally-glued 3/4" MDF with a melamine backer. The vinyl is bonded to the high-density core using heat and pressure resulting in a product with excellent wear and heat resistance properties. When Rigid Thermofoil is selected some fillers, panels, moulding and embellishments will use a non-Melamine backed core. A heat shield must be used where doors are near heat producing appliances.

.9 Edgeband
- .1 For wood veneer casework: Not used.
- .2 For Plastic Laminate Casework: High Pressure Decorative Laminate (HPDL).
- .3 For Thermofoil Casework: Thermofoil veneer of same finish colour and cut as exposed surfaces.

.10 Nails and staples: to CSA B111.

.11 Wood screws: to CSA B35.4-1972, type and size to suit application.

.12 Sealant: in accordance with Section 07 92 00 - Joint Sealants. to CAN 2-19.13-M82, one component, shore A hardness.

.13 Hardware:
- .1 Meeting requirements of AWS for grade specified

.2 Finish:
.1 Exposed hardware: 100mm Chrome “D” Hardware.
.2 Semi exposed hardware: Manufacturer's standard finish.
.3 Drawer Guides: full extension accuride meeting requirements of AWS for type and size of drawer.
.1 File drawers require full extension guides.
.4 Hinges: BLUM Model 90-170 soft-closing. Hidden styles as required -12mm.
.5 Cabinet shelving: 16mm mortised/flush mount standard with B7102 shelf clips, bright zinc finish, #153506UK & 153538UK.

## 2.02 MANUFACTURED UNITS

.1 General:
.1 Materials and methods of construction to meet requirements of AWS for grade or grades specified.
.1 If there is conflict between plans and/or specifications and AWS, plans and specifications shall govern.

.2 Laminated Plastic Counter tops - Kitchenette 124 (Drawing A104, A402):
.1 Laminate: refer to colourboard
.2 Core material: MDF
.1 Wet tops Water resistant MDF.
.3 Back splashes:100 mm high.
.4 Front edges: 6mm radius, top & bottom, with sawcut drip edge.

.3 Casework Doors & Drawer Fronts – Kitchenette 124 (Drawing A104, A402):
.1 Fabricate to AWMAC custom grade, supplemented as follows:
.1 Front: 15mm Thermofoil on G1S Plywood.
.2 Drawer Bottoms: 6mm M.C.P.
.3 Sides and Backs: 12mm, M.C.P,
.4 Bottoms: 12mm M.C.P.
.5 Adjustable Shelves: 19mm THK. Melamine on G2S Plywood
.6 Colour: Please refer to Finish Schedule.

## 2.03 FABRICATION

.1 Set nails and countersink screws apply wood filler to indentations, sand smooth and leave ready to receive finish.

.2 Shop install cabinet hardware for doors, shelves, and drawers. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinets to be adjustable, unless noted otherwise.

.4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

### 2.04 FINISHING

.1 Finish in accordance with Section 09 91 23 - Interior Painting.

.2 Factory Finishing

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.02 INSTALLATION

.1 Install work in conformance with the AWS.

.2 Conform to AWS Grade(s).

.3 Fasten and anchor millwork securely.
- .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .2 Ream screws after installation to prevent removal.

.4 Use draw bolts in countertop joints.

.5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting, or penetrating objects.

.6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

.7 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.8 Install pre-finished millwork at locations shown on the drawings. Position accurately, level, plumb and straight.

.9 Provide cutouts for inserts, grilles, appliances, grommets, outlet boxes and other penetrations. Round internal corners and seal exposed core.

### 3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean millwork and cabinet work, inside cupboards and drawers and outside surfaces.
- .2 Remove excess glue from surfaces.

## 3.04 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 1126-14, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
- .2 ASTM C 1289-14, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .3 ASTM E 96/E 96M-13, Standard Test Methods for Water Vapour Transmission of Materials.
- .4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .5 ASTM C1104/C1104M-00, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- .6 ASTM C1338-19, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- .7 ASTM C665-17, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .8 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 71-GP-24M-AMEND-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.3 CSA Group
- .1 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
- .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .3 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.
- .4 CAN/ULC-S704-11, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .5 UL 1256, CAN/ULC S126M and NFPA 285 testing.
- .6 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for board insulation and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.

.4 Samples: Not Required

.5 Certificates:
.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test Reports:
.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.7 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.
.2 Acceptable manufacturer – Dow Chemical Canada Inc.

## 1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect specified materials from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.01 INSULATION

.1 Rigid Cellular Polyisocyanurate:
.1 Walls: Soprema SOPRA-ISO V PLUS
.1 Flat, thickness as per drawings, width to suit fastener requirements, maximum practical length.
.2 Roof: Soprema SOPRA-ISO PLUS
.1 Flat, thickness as per drawings, width to suit fastener requirements, maximum practical length.

.2 Extruded polystyrene (XPS): to CAN/ULC-S701.
.1 Type: 4.
.2 Compressive strength: 240 kPa.
.3 Thickness: 38 mm.
.4 Size: 610x1220.
.5 Edges: shiplapped.

.3 Semi-rigid mineral wool: to CAN/ULC S702
  .1 Fire Performance:
    .1 Non-combustibility: to CAN/ULC S114.
    .2 Surface Burning Characteristics: to CAN/ULC S102.
      .1 Flame spread: 0.
      .2 Smoke developed: 0.
  .2 Thermal Resistance: RSI value/25.4 mm at 24° C: 0.76 m²K/W to ASTM C518.
  .3 Water Vapour Permeance: 1555 ng/Pa.s.m².
  .4 Moisture sorption: 1% maximum to ASTM C1104/C1104M.
  .5 Fungi resistance: Zero mold growth to ASTM C1338.
  .6 Corrosive resistance:
    .1 Steel to ASTM C665: Pass.
    .2 Stainless steel to ASTM C795: Pass.

## 2.02 ADHESIVE

.1 Adhesive (for polyiso): as recommended by insulation manufacturer.

## 2.03 ACCESSORIES

.1 N/A

# 3 EXECUTION

## 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for board insulation application in accordance with manufacturer's written instructions.
  .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.02 INSTALLATION

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 type A chimneys and CSA B149.1 and CSA B149.2 type B and L vents.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Consultant.

## 3.03 RIGID INSULATION INSTALLATION

.1 Apply insulation board in accordance with manufacturer's recommendations.

.2 Imbed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.

.3 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

## 3.04 PERIMETER FOUNDATION INSULATION

.1 N/A

## 3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Canadian Urethane Foam Contractors Association Inc. (CUFCA)

.2 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S101-14, Standard Methods of Fire Tests of Building Construction and Materials.
- .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .3 CAN/ULC-S705.1-2018-REV1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.
- .4 CAN/ULC-S705.2:2020, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS.

.3 Test Reports:
- .1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

.4 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.5 Manufacturer's Reports:
- .1 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

## 1.03 QUALITY ASSURANCE

.1 Applicators to conform to CUFCA Quality Assurance Program.

.2 Qualifications:
- .1 Installer: person specializing in sprayed insulation installations with documented experience.
- .2 Manufacturer: company with experience in producing of material used for work required for this project, with sufficient production capacity to produce and deliver required units without causing delay in work.

.3 Mock-up:
- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up 10 sq m minimum, of sprayed insulation including one inside corner and one outside corner, and door and window openings.
- .3 Mock-up may be part of finished work.
- .4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sprayed insulation work.

.4 Health and Safety Requirements: worker protection:
- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
- .2 Workers must wear gloves, respirators, dust masks, long sleeved clothing, eye protection, and protective clothing when applying foam insulation.
- .3 Workers must not eat, drink or smoke while applying foam insulation.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, and packaging materials as applicable.

## 1.05 SITE CONDITIONS

.1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

## 2 PRODUCTS

### 2.01 MATERIALS

.1 Insulation: spray polyurethane to CAN/ULC-S705.1.

.2 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .1 Maximum VOC limit 100 g/L.

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sprayed insulation application accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.02 APPLICATION

.1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.

.2 Use primer where recommended by manufacturer.

.3 Apply sprayed foam insulation in thickness as indicated.

### 3.03 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
- .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### 3.04 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.
- .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

.3 Waste Management: separate waste materials for reuse and recycling as applicable.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
- .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect specified materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.01 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 0.15 mm thick

## 2.02 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealants.

.3 Staples: minimum 6 mm leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for vapour retarder installation in accordance with manufacturer's written instructions.
- .1 Contractor to inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.02 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall, ceiling and floor assemblies prior to installation of gypsum board to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

### 3.03 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

### 3.04 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:
- .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
- .2 Lap sheet over sealant and press into sealant bead.
- .3 Install staples through lapped sheets at sealant bead into wood substrate.
- .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### 3.05 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:
- .1 Attach first sheet to substrate.
- .2 Apply continuous bead of sealant over solid backing at joint.
- .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
- .4 Install staples through lapped sheets at sealant bead into wood substrate.
- .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

## 3.06 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
- .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
- .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.
- .3 Install outlet gaskets on all outlets prior to the installation of outlet faceplates.

## 3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee
- .1 CCDC 2-94, Stipulated Price Contract.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.13M-M87, Sealing Compound, One Component, Elastomeric Chemical Curing.
- .2 CAN/CGSB-19.24M-M90, Multi-Component, Chemical Curing Sealing Compound.
- .3 CGSB 19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.3 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.

## 1.03 QUALITY ASSURANCE

.1 Qualifications:
- .1 Applicator: company specializing in performing work of this section with minimum 2 years documented experience with installation of air/vapour barrier systems.
  - .1 Completed installation must be approved by the material manufacturer.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Avoid spillage: immediately notify Departmental Representative spillage occurs and start clean up procedures.

.4 Clean spills and leave area as it was prior to spill.

## 1.05 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

.2 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

### 1.06 SEQUENCING

.1 Sequence work in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Charts.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

### 1.07 WARRANTY

.1 For sealant and sheet materials the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.

.2 Provide three year warranty under provisions of Section 01 78 00 - Closeout Submittals

.3 Warranty: include coverage of installed sealant and sheet materials which:
- .1 Fail to achieve air tight and watertight seal.
- .2 Exhibit loss of adhesion or cohesion.
- .3 Do not cure.

## 2 PRODUCTS

### 2.01 SHEET MATERIALS

.1 Tyvek weather barrier under siding.

.2 Blueskin semi-pervious membrane, manufactured by Bakor or approved alternate.

.3 Weather shield, roof membrane.

### 2.02 SEALANTS

.1 Sealant: Acoustic Caulking

.2 Substrate cleaner: Non-corrosive type recommended by sealant manufacturer.

### 2.04 ADHESIVES

.1 Joint sealing tape: Air resistant pressure sensitive adhesive tape, type recommended by manufacturer.

.2 Manufacturer primer as required.

### 2.05 ACCESSORIES

.1 Thinner and cleaner for Sheet: as recommended by sheet material manufacturer.

.2 Attachments: Staples: Minimum 6mm leg.

## 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

## 3.02 EXAMINATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.

.3 Report unsatisfactory conditions to Departmental Representative in writing.

.4 Do not start work until deficiencies have been corrected.
.1 Beginning of Work implies acceptance of conditions.

## 3.03 PREPARATION

.1 Remove loose or foreign matter, which might impair adhesion of materials.

.2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.

.3 Ensure substrates are free of surface moisture prior to application of self-adhesive membrane and primer.

.4 Ensure metal closures are free of sharp edges and burrs.

.5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

## 3.04 INSTALLATION

.1 Install materials in accordance with manufacturer's instructions.

.2 The weather barrier is to be applied with staples to sheathing on new exterior wall construction. On the new section off exterior wall around windows, lap and seal with tape the new weather barrier with the existing. At openings in the building envelope, place the weather barrier under the vapour barrier and seal with two continuous beads of caulking.

.3 Apply sealant within recommended application temperature ranges.
.1 Consult manufacturer when sealant cannot be applied within these temperature ranges.

## 3.05 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

## 3.06 PROTECTION OF WORK

.1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B18.6.3-2011, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).

.2 ASTM International
- .1 ASTM D 2369-10e1, Test Method for Volatile Content of Coatings.
- .2 ASTM D 2832-92(2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .3 ASTM D 5116-10, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .2 CAN/CGSB-93.3-M91, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.
- .3 CAN/CGSB-93.4-92, Galvanized and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.
- .4 CAN/CGSB-93.5-92, Installation of Metal Residential Siding, Soffits and Fascia.

.4 CSA International
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.5 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for [metal siding] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.
- .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.

.4 Samples:
- .1 Submit duplicate 150x150 mm samples of siding material, of colour and profile specified.

## 1.03 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect metal siding from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## 2 PRODUCTS

## 2.01 STEEL CLADDING AND COMPONENTS

.1 Vicwest 12MM corrugated 22 gauge galvalume siding, colour as per finish schedule

.2 Exterior weather barrier: Tyvek.

.3 Vicwest Traditions 100, Colour as per finish schedule.

## 2.02 FASTENERS

.1 Install siding attachments sequentially from starter strips up, to manufacturer’s instructions. Use VistaCoat gasketed fastners matching the colour of siding.

## 2.03 CAULKING

.1 Sealants: in accordance with Section 07 92 00- Joint Sealants.
- .1 Test for acceptable VOC emissions in accordance with ASTM D 2369 and ASTM D 2832.
- .2 Adhesives and sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

## 2.04 SHEATHING PAPER

.1 Exterior wall sheathing paper: to CAN/CGSB-51.32, as indicated.

## 2.05 ACCESSORIES

.1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour and gloss as cladding, with fastener holes pre-punched.

a) Metal starter strips

b) Colour-matched mouldings for joints, inside and outside corners, J-mouldings, drip caps and Z flashings

c) Colour-matched touch-up paint or stain

d) Colour-coordinated caulk/sealant

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.02 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### 3.03 INSTALLATION

.1 Install cladding in accordance with CGSB 93.5, and manufacturer's written instructions.

.2 Install one layer exterior wall sheathing paper horizontally by stapling lapping edges 150 mm.

.3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.

.4 Install outside corners, fillers and closure strips with carefully formed and profiled work.

.5 Install soffit and fascia cladding as indicated.

.6 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.

.7 Attach components in manner not restricting thermal movement.

.8 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

### 3.04 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### 3.05 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by preformed metal siding installation.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 The Aluminum Association Inc. (AAI)
- .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.
- .2 AAI DAF45-03, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A 240/A 240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .3 ASTM A 606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
- .4 ASTM A 653/A 653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM A 792/A 792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .6 ASTM B 32-04, Standard Specification for Solder Metal.
- .7 ASTM B 370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
- .8 ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
- .9 ASTM D 822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.3 Canadian Roofing Contractors Association (CRCA)
- .1 Roofing Specifications Manual 1997.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.5 Canadian Standards Association (CSA International)
- .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
- .2 AAMA/WDMA/CSA 101/I.S.2/A440-2008, Standard/Specification for Windows, Doors, and Unit Skylights.
- .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Shop drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.

.4 Samples:
.1 Submit 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

## 1.03 QUALITY ASSURANCE

.1 Pre-Installation Meetings: convene pre-installation meeting in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

# 2 PRODUCTS

## 2.01 SHEET METAL MATERIALS

.1 Galvalume sheet steel: 24 gauge thickness unless noted otherwise, colour to match the adjacent siding.

.2 Refer to drawings for flashing profiles and location of installation.

## 2.02 FABRICATION

.1 Fabricate metal flashings and other sheet metal work as indicated, finish to match siding.

.2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.

.3 Form pieces in 2400 mm maximum lengths.
.1 Make allowance for expansion at joints.

.4 Hem exposed edges on underside 12 mm.
.1 Mitre and seal corners with sealant.

.5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

## 2.06 METAL FLASHINGS

.1 Form flashings to profiles indicated from 24 gauge (unless noted otherwise) sheet metal with Galvalume finish.

## 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.02 INSTALLATION

.1 Install sheet metal work as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal.
- .1 Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
- .1 Flash joints forming tight fit over hook strips, as detailed.

.5 Lock end joints and caulk with sealant.

.6 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.7 Caulk flashing at cap flashing with sealant.

.8 Install pans, where shown around items projecting through roof membrane.

### 3.03 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
- .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### 3.06 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Leave work areas clean, free from grease, finger marks and stains.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.2 National Research Council Canada (NRC)
- .1 National Building Code of Canada [2015] (NBC).

.3 Underwriter's Laboratories of Canada (ULC)
- .1 ULC-S115-1995, Fire Tests of Fire stop Systems.

## 1.02 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1)): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
- .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

## 1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
- .2 Construction details should accurately reflect actual job conditions.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

## 1.04 QUALITY ASSURANCE

.1 Qualifications:
- .1 Installer: company specializing in fire stopping installations approved by manufacturer.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning [work of this Section], with contractor's representative and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart:
- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Co-ordination with other building subtrades.
- .4 Review manufacturer's installation instructions and warranty requirements.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
- .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
- .2 Upon completion of Work, after cleaning is carried out.

## 1.05 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.01 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
- .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
- .2 Fire stop system rating: 45 min.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

## 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.02 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

### 3.03 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

### 3.04 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: certified fire stop system component.
.1 Ensure pipe insulation installation precedes fire stopping.

## 3.05 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

## 3.06 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

## 3.07 SCHEDULE

.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
.2 Edge of floor slabs at curtain wall and precast concrete panels.
.3 Top of fire-resistance rated masonry and gypsum board partitions.
.4 Intersection of fire-resistance rated masonry and gypsum board partitions.
.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
.6 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
.7 Openings and sleeves installed for future use through fire separations.
.8 Around mechanical and electrical assemblies penetrating fire separations.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 919-08, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
- .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.3 General Services Administration (GSA) - Federal Specifications (FS)
- .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Manufacturer's product to describe:
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Manufacturer's Instructions:
- .1 Submit instructions to include installation instructions for each product used.

## 1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect joint sealants from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## 1.05 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Proceed with installation of joint sealants only when:
  - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
  - .2 Joint substrates are dry.
  - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:
- .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
- .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

## 1.06 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Ventilate area of work as directed by Departmental Representative.

# 2 PRODUCTS

## 2.01 SEALANT MATERIALS

.1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

.2 Sealant Type 2: CAN 2-19-18-M82; Silicone base, solvent curing. Interior use generally.
- .1 Colour: White in Washroom, clear at all other locations. Not to be painted.

.3 Sealant Type 3: CAN\CGSB-19.13-M87; Elastomeric, one compound, chemical curing. Interior use generally on joints which may be painted.
- .1 Colour: White in washroom, clear at all other locations.

.4 Sealant Type 4: CGSB 19-GP-22M-77; Mildew and fungus resistant. Interior use where mildew and fungus resistance is required. ie. Washroom around plumbing fixtures.
- .1 Colour: White in Room 310, clear at all other locations.

### 2.02 BACK-UP MATERIALS

.1 Polyethylene, Urethane, Neoprene or Vinyl Foam
- .1 Extruded closed cell foam backer rod.
- .2 Size: oversize 30 to 50%.

.2 High Density Foam: Extruded closed cell polyvinyl chloride (PVC) or neoprene foam backer, size as recommended by manufacturer.

.3 Bond Breaker Tape: Polyethylene bond breaker tape, which will not bond to sealant.

### 2.03 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

.2 Primer: in accordance with sealant manufacturer's written recommendations.

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.02 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants. Joint depth to half the joint width minimum 3mm to maximum 25mm.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

### 3.03 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

## 3.04 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

## 3.05 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

## 3.06 APPLICATION

.1 Sealant:
- .1 Apply sealant in accordance with manufacturer's written instructions.
- .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
- .3 Apply sealant in continuous beads.
- .4 Apply sealant using gun with proper size nozzle.
- .5 Use sufficient pressure to fill voids and joints solid.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
- .2 Do not cover up sealants until proper curing has taken place.

## 3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Clean adjacent surfaces immediately.
- .3 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.08 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 653/A 653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM B 29-03, Standard Specification for Refined Lead.
- .3 ASTM B 749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)
- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)
- .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA)
- .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
- .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

## 1.02 SYSTEM DESCRIPTION

.1 Design Requirements:
- .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -45 degrees C to 15 degrees C.
- .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
- .3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 NFPA 252 for ratings specified or indicated.
- .4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104, and listed by nationally recognized agency having factory inspection services.

## 1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.
- .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
- .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing, fire rating finishes.
- .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
- .5 Submit test and engineering data, and installation instructions.

## 1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

# 2 PRODUCTS

## 2.01 MATERIALS

.1 Galvanized steel sheet: commercial quality to ASTM A526, with Zinc Coating Designation ZFO75, locations for interior doors and frames as per ASTM A525.

.2 Doors:
- .1 For interior doors .064" base thickness.
- .2 For exterior doors .064" base thickness.
- .3 Door Core:
  - .1 Interior Doors: structural core consisting of partical board to thickness indicated.
  - .2 Exterior Doors: bonded core consisting of urethane or isocyanurate board insulation to CGSB 51-GP-21M-78, bonded to door skins, with no metal to metal contact except at edges.

.3 Door Frames:
- .1 Steel frames to exterior openings 1.58mm base thickness.
- .2 Steel frames to interior openings 0.79mm base thickness.

.4 Provide other door and frame components in accordance with CSDFMA requirements.

.5 Primer:
- .1 For galvanized steel sheet: CGSB 1-GP-178Ma-Dec-82.

.6 Door Bumpers: Black neoprene

.7 Frame head and jamb reinforcement: 100mm x 38mm structural steel channel to CAN 3-G40.21-M81.

.8 Provide top cap for exterior doors.

.9 Adhesives: Heat resistant structural reinforced adhesive.

**2.02 FRAMES FABRICATION GENERAL**

.1 Fabricate doors and frames as detailed, to Canadian Steel Door and Frame Manufacturers' Association, (CSDFMA) Canadian Manufacturing Specifications for Steel Doors and Frames, 1982; except where specified otherwise. Reinforce door and frames to suit hardware requirements.

.2 Blank, reinforce, drill, and tap doors and frames for mortised hardware. Reinforce doors and frames for surface mounted hardware.

.3 Apply, at factory, touch up primer to doors and frames manufactured from galvanized steel where coating has been removed during fabrication.

**2.03 DOORS**

.1 Fabricate doors with longitudinal edges seamless, welded, filled, and sanded flush.

.2 Fabricate doors with top and bottom channels flush, extending full width of door and welded to both faces.

.3 Construct matching sidelite panels in same manner as doors.

.4 Fabricate exterior doors with flush closure channel top and weep holes in bottom channel.

**2.04 FRAMES**

.1 Cut mitres and joints accurately and weld continuously on inside of frame profile.

.2 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

.3 Provide adjustable jamb anchors for fixing at floor.

.4 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of doors.

.5 Fabricate thermally broken frames for exterior doors using steel core, separating exterior portion of frame from interior portion with polyvinyl thermal breaks.

## 3 EXECUTION

**3.01 MANUFACTURER'S INSTRUCTIONS**

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.02 INSTALLATION GENERAL**

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

**3.03 FRAME INSTALLATION**

.1 Set frames plumb, square, level and at correct elevation. Acceptable distortion of 1.58mm out of plumb; max. twist corner 3mm

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at center of head for openings over 4' (1200mm) wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

**3.04 DOOR INSTALLATION**

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.2 Install in accordance with National fire Codes, Volume 4, produced by National Fire Protection Association (NFPA) 80.

.3 Provide even margins between doors and jambs and doors and finished floor as follows:
- .1 Hinge side: 0.79 mm.
- .2 Latchside and head: 1.58 mm
- .3 Finished floor: 12 mm (except fire rated doors).

.4 Adjust operable parts for correct function.

**3.05 FINISH REPAIRS**

.1 Touch up with primer finishes damaged during installation.

**3.06 GLAZING**

.1 Install glazing for doors in accordance with Section 08 80 50 - Glazing.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 NAFS, NAFS-08, AAMA/WDMA/CSA 101/I.S.2/A440-08, North American Fenestration Standard/Specification for windows, doors and skylights

.2 A440S1, Canadian Supplement to AAMA/WDMA/CSA101/I.S.2/A440

.3 National Building Code of Canada: 2015 edition.

.4 NFRC 100, Procedure for Determining Fenestration Product U-Factors

.5 NFRC 200, Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

.6 NFRC 701.03, NFRC Simulation Reporting Requirements

.7 CSA A440.2, Fenestration Energy Performance

.8 CAN/CGSB-12.8 – Insulating Glass Units

.9 IGMA, Insulated Glass Manufacturers Alliance

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Section 01 33 00: Submission Procedures.

.2 Product Data: Provide dimensions, anchorage and fasteners, glass, and internal drainage details.

.3 Submit shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

.4 Submit proof of performance and any support documentation as follows:

.1 Proof of energy performance for total window U-value, based on the standard ASTM test size. This proof may be referenced to a current listing with: Energy Star Canada, National Fenestration Rating Council (NFRC), OR may be a computer simulated performance test report signed by an independent NFRC/CSA accredited simulation laboratory and prepared in accordance with CSA A440.2-09 or NFRC701.03-2010.

## 1.04 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for windows for incorporation into manual.

## 1.05 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Minimum ten (10) years' experience in producing fiberglass windows.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by manufacturer.

.3 Perform Work in accordance with, IGMA for glazing installation methods.

**1.06 DELIVERY, STORAGE AND HANDLING**

.1 Deliver materials to site undamaged in original, unopened packaging.

.2 Accept products on site only in new condition and verify that there is no damage.

.3 Store products in an upright position, off ground, and under cover. Protect products from weather, direct sunlight, and construction activities.

## 2 PRODUCTS

**2.01 MANUFACTURER**

.1 Acceptable manufacturer:

.1 DUXTON Windows and Doors, Winnipeg, Manitoba

.2 Equivalent, alternates will be reviewed at the shop drawing review stage for compliance and acceptance.

.2 Products of this section to be of a single approved manufacturer.

**2.02 MATERIALS**

.1 Frames and sash profiles of pultruded fiberglass, with minimum wall thickness of 2.3 mm, minimum glass content of 60%, and to sizes and shapes of fixed and operating windows as indicated on the drawings. Non-structural accessory members may be vinyl or aluminum and must be identified as such.

.2 Insulation: Frame and sash cavities to be filled with EPS insulation – Density 20.

.3 Fasteners: Galvanized.

**2.03 COMPONENTS**

.1 Frame Profile: Series 328, awning low profile, Depth: 82.55mm or 3 ¼ inches. Colour refer to finish schedule.

.2 Weatherstripping

.1 Primary Q-Lon air-seal gasket or EPDM closed-cell rubber gasket on interior in black, with Santoprene bulb gasket on the exterior to provide a double weather barrier.

.3 Sealant and Backing Materials:

.1 Perimeter Sealant: As recommended by Manufacturer.

.4 Flashings: profiles detailed.

**2.04 HARDWARE**

.1 Concealed E-Gard coated heavy gauge steel hinge, stainless steel track, roto gear operators with collapsible handles, snubbers and sequentially locking multi-point locks.

.2 Hardware to be installed with mechanical fasteners.

**2.05 GLASS**

.1 Insulating Glass: Cardinal GI, CAN2-12.8M triple pane; 5mm clear glass; glass with Low E argon filled cavities. Total unit thickness 1-3/8 inch.

.2 Low E coating: Cardinal GI 1-LoE-272.

.3 Spacer/separator to provide continuous vapour barrier between interior of sealed unit and secondary seal.

**2.06 FABRICATION**

.1 Frame Corners: Mitered, joined and sealed with a molded reinforced polymer corner key and mechanically secured with screws and silicone.

.2 Joints are factory sealed with silicone and neatly fitted together. The perimeter of open-back frames shall be filled with insulation.

.4 Surface applied simulated divided lites to be installed on exterior and or interior lites of the glazing unit, using exterior-grade double-sided adhesive tape.

.3 Allow internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep.

.3 Glazing Method: Laid-in glazing using polyethylene closed cell adhesive tape on the exterior fixed stop, and an EPDM rubber spline locked in from the interior, providing a secure and positive seal for the glass, and facilitating access to the glazing for any future service needs.

.4 Insect screen: miter corners, fit screen into frame and secure.

.4 Arrange fasteners to be concealed from view.

**2.07 FINISHES**

.1 Exposed surfaces coated with a durable isocyanate-free 2-part Polymer Enamel with a minimum dry film thickness of 1.5 mm and a medium gloss of 20-55. Finishes to resist chipping, blistering, chalking discoloration and aging under all atmospheric conditions.

.2 Interior Surface: White

.3 Exterior Surface: White

.4 Operators and exposed hardware: White

**2.08 ACCESSORIES**

.1 Not included

## 3 EXECUTION

### 3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.02 INSTALLATION

.1 Installation to be performed by experienced installers in accordance with manufacturer's instructions and CSA A-440.4 Standards. Window to be plumb and square after installation is complete and sealed to both interior and exterior wall with a high-quality sealant around the perimeter of the frame. If perimeter cavity is to be foamed, additional anchorage may be required to prevent bowing. To be the responsibility of the installers to make all necessary final adjustments to ensure normal and smooth operation.

.2 Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, alignment with adjacent work.

.3 Coordinate secure attachment and continuous seal of air and vapour barrier materials to Work of this Section.

.4 Spray low-expansion foam insulation into shim spaces at perimeter to maintain continuity of the thermal/air barrier.

.5 Install glass to manufacturer's written instructions.

.6 Install perimeter type backing materials, and sealant in accordance with Section 07 92 00 and manufacturer's written instructions. Apply sealant to ends of sill for watertight seal.

.7 Install accessory items as required.

.8 Install insect screens and hardware covers on operable windows.

## 3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.04 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)

- .1 ANSI/BHMA A156.1 – Butts and Hinges (1996).
- .2 ANSI/BHMA A156.2 – Bored and Preassembled Locks and Latches (2011).
- .3 ANSI/BHMA A156.3 – Exit Devices (2008).
- .4 ANSI/BHMA A156.4 – Door Controls –Closers (2008)
- .5 ANSI/BHMA A156.5 – Auxiliary Locks and Associated Products (2010)
- .6 ANSI/BHMA A156.6 – Architectural Door Trim (2010)
- .7 ANSI/BHMA A156.7 – Template Hinge Dimensions (2009)
- .8 ANSI/BHMA A156.8 – Door Controls –Overhead Stops and Holders (2010)
- .9 ANSI/BHMA A156.9 – Cabinet Hardware
- .10 ANSI/BHMA A156.10 – Power Operated Pedestrian Doors
- .11 ANSI/BHMA A156.11 – Cabinet Locks
- .12 ANSI/BHMA A156.12 – Interconnected Locks and Latches
- .13 ANSI/BHMA A156.13 – Mortise Locks and Latches Series 1000 (2005)
- .14 ANSI/BHMA A156.14 – Sliding and Folding Door Hardware
- .15 ANSI/BHMA A156.15 – Closer/Holder/Release Devices (2006)
- .16 ANSI/BHMA A156.16 – Auxiliary Hardware (2008)
- .17 ANSI/BHMA A156.17 – Self-closing Hinges and Pivots (2010)
- .18 ANSI/BHMA A156.18 – Materials and Finishes (2006)
- .19 ANSI/BHMA A156.19 – Power Assist and Low Energy Operated Doors (2007)
- .20 ANSI/BHMA A156.20 – Strap and Tee Hinges, Hasps
- .21 ANSI/BHMA A156.21 – Thresholds (2009)
- .22 ANSI/BHMA A156.22 – Door Gasketing and Edge Seal Systems (2005)
- .23 ANSI/BHMA A156.23 – Electromagnetic Locks
- .24 ANSI/BHMA A156.24 – Delayed Egress Locking Systems (2003)
- .25 ANSI/BHMA A156.25 – Electrified Locking Devices (2007)
- .26 ANSI/BHMA A156.26 – Continuous Hinges (2006)
- .27 ANSI/BHMA A156.27 – Power and Manual Operated Manual Revolving Pedestrian Doors
- .28 ANSI/BHMA A156.28 – Master Keying Systems
- .29 ANSI/BHMA A156.29 – Exit Locks and Alarms (2007)
- .30 ANSI/BHMA A156.30 – High Security Cylinders
- .31 ANSI/BHMA A156.31 – Electric Strikes and Frame Mounted Actuators

.2 NFPA

- .1 NFPA 80 – Standard for Fire Doors and Other Opening Protectives 2010 Edition.
- .2 NFPA 101 – Life Safety Code 2006 Edition.
- .3 NFPA 105 – Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives 2007 Edition.
- .4 NFPA 252 – Standard Methods of Fire Tests of Door Assemblies 2012 Edition.

.3 UL

- .1 UL 10B – Fire Tests of Door Assemblies.
- .2 UL 10C – Positive Pressure Fire Tests of Door Assemblies.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Schedule:
- .1 Submit six (6) copies of the fully detailed hardware schedule.
- .2 Hardware schedule shall indicate product number, description, manufacturer, size, fasteners, application, and finish of each item required.
- .3 Hardware sets with electrified hardware shall include an operation description, elevation drawing, and a point-to-point drawing.

.3 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Samples: Not Applicable.

.5 Manufacturer's Instructions: submit manufacturer's installation instructions.

## 1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

## 1.04 MAINTENANCE MATERIALS SUBMITTALS

.1 Extra Stock Materials:
- .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Tools:
- .1 Supply 2 sets of wrenches for door closers and locksets.

## 1.05 QUALITY ASSURANCE

.1 Regulatory Requirements:
- .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.06 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect door hardware from nicks, scratches, and blemishes.
.3 Protect prefinished surfaces with wrapping strippable coating.
.4 Replace defective or damaged materials with new.

## 1.07 WARRANTY

.1 All materials and installation shall be provided with a minimum of one (1) year warranty against defects and workmanship from the date of substantial completion of the project.

.2 Product warranties in excess of one (1) year shall be provided for the following hardware products:
.1 Door Closers – ten (10) years.
.2 Mortise Locks – ten (10) years.
.3 Exit Devices – five (5) years.
.4 Cylindrical Locks – seven (7) years.
.5 Electrified Hardware – two (2) years.
.6 Floor Closers – ten (10) years.

## 1.08 MAINTENANCE

.1 Service Contracts

.1 All low energy automatic door operators and low voltage electrified hardware shall be provided with a one (1) year maintenance and service contract provided by the installation company from the date of substantial completion of the project.

.2 Extra Materials
.1 All remaining fasteners and special installation tools shall be turned over to the Owner upon substantial completion of the project.
.2 Clearly mark each item as to its use and applicable piece of hardware.

# 2 PRODUCTS

## 2.01 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.

.2 The noted manufacturers are acceptable; alternates will be reviewed for compliance.

## 2.02 MANUFACTURERS

.1 The following list of products and manufacturer are acceptable:
.1 Hinges by McKinney.
.2 Continuous Hinges by McKinney, Markar, or Pemko.
.3 Pivot Hinges by Rixson.
.4 Floor Closers by Rixson
.5 Mortise locks by Sargent.
.6 Exit Devices by Sargent.
.7 Door Closers by Sargent.
.8 Flushbolts by Gallery Specialty Hardware.
.9 Kickplates, mop-plates, push plates, and armour plates by Rockwood Manufacturing.
.10 Overhead stops and holders by Rixson.
.11 Gasketing and door seals by Pemko.
.12 Door bottoms and automatic door bottoms by Pemko.

.13 Meeting stiles and astragals by Pemko.
.14 Thresholds by Pemko.
.15 Door pulls and push/pull sets by Rockwood Manufacturing.
.16 Low Energy Automatic Door Operators by Ditec Entrematic.
.17 Access Control accessories by Securitron.
.18 Power Supplies by Securitron.
.19 Electrified Hardware Harness by Tillicum.
.20 Electric Strikes by HES.

## 2.03 MATERIALS

.1 Screws and Fasteners
- .1 Furnish all screws, bolts, nuts, expansion shields, special fasteners, and other fastening devices as indicated on the hardware schedule or as recommend by the manufacturer for proper installation and operation.
- .2 Only the original fasteners as packaged by the manufacture shall be used, unless noted otherwise.
- .3 Exposed fasteners shall match the finish of the hardware.
- .4 Surface mounted hardware installed on hollow metal and wood doors, which are internally reinforced, should not be attached with through- bolts or sex nuts and bolts, unless noted otherwise.

.2 Butt Hinges:
- .1 Butt type hinges shall be TA series by McKinney.
- .2 Butt hinges on reverse bevel locking doors shall have non-removable pins (NRP).
- .3 Butt hinges on reverse bevel exterior doors shall be TA-NRP series by McKinney.
- .4 Where required, electrified hinges shall be Quick Connect (QC) TA series hinge by McKinney.
- .5 Butt hinge height sizing shall be in accordance with the following:
  - .1 Doors up to 1-3/4” thick, up to 3’0” wide, shall be 4-1/2”
  - .2 Doors up to 1-3/4” thick, over 3’0” wide, up to 4’0” wide, shall be 5”
  - .3 Doors up to 1-3/4” thick, over 4’0” wide, shall be 6”
  - .4 Doors over 1-3/4” thick, shall be 5”
- .6 The width of butt hinges shall be sufficient to minimally clear all trim.
- .7 Furnish one (1) pair of hinges for all doors up to 5’0” high. Furnish on additional hinge for every additional 30” of door height or fraction thereof.
- .8 Furnish heavy weight hinges on all exterior, stairwell, and public restroom doors, unless noted otherwise in the hardware schedule.
- .9 Continuous heavy weight hinge for all doors over 3’0” wide, unless noted otherwise in the hardware schedule

.3 Door Bolts
- .1 Flushbolts:
  - .1 Flushbolts shall be 500 series by Rockwood Manufacturing.
  - .2 Fire rated hollow metal doors with automatic latching flushbolts shall be 28/2900 series by Rockwood Manufacturing.
  - .3 Fire rated wood doors with automatic latching flushbolts shall be 28/2900 series by Rockwood Manufacturing.
  - .4 Furnish all flushbolts with 570 series dust proof strike by Rockwood Manufacturing.
  - .5 Furnish flushbolts in pairs (top and bottom), unless noted otherwise in the hardware schedule.
- .2 Door Pulls:
  - .1 Door pulls shall be RM series by Rockwood Manufacturing, Black Powder.

.2 Furnish heavy duty mounting bolts on all sets of door pulls including through-bolt mounted and back to back mounted door pulls.

.3 Locking Door Pulls:

.1 Locking door pulls shall be LP series by Rockwood Manufacturing, Black Powder.

.2 Furnish locking door pull as a complete set with back to back mounted door pulls with the required mounting hardware suitable for the door type.

.3 Furnish the required rim type cylinder with the locking door pull.

.4 Locks and Latches

.1 Mortise Locks

.1 Mortise locks shall be Schlage, L Series.

.2 Locks shall meet or exceed the requirements of ANSI/BHMA A156.13 grade 1.

.3 Lock bodies shall have field reversible handing.

.4 Locks shall comply with UL10C and UBC 7-2 positive pressure requirements.

.5 Locks required for fire doors shall be listed by Underwriters Laboratories for ratings of A label (3 hours) and less, for doors up to 4’0” x 10’0” and pairs of doors 8’0” x 10’0”.

.6 Furnish locksets with cast levers and wrought roses.

.7 Strikes shall be non-handed with a curved lip.

.8 Furnish extended lip strikes where required by frame/trim condition.

.9 Furnish flat lip strikes on pairs of doors with reverse bevel and over lapping astragal.

.10 Furnish wrought box strike cases for frames in masonry walls.

.11 Furnish privacy function locksets which visual occupancy indicator.

.12 Electrified locksets shall be 24VDC.

.2 Cylindrical Locks

.1 Cylindrical locks shall be Schlage, L lever, L rose design.

.2 Locks shall meet or exceed the requirements of ANSI/BHMA A156.2 Series 4000, Grade 1 with all standard trims.

.3 Locks shall be non-handed with bi-directional lever operation, except “G” and “Y” lever designs.

.4 Through-bolt mounting shall be adaptable to fit a variety of standard cylindrical lock preps.

.5 Locks shall comply with UL10C and UBC 7-2 positive pressure requirements.

.6 Locks required for fire doors shall be listed by Underwriters Laboratories for ratings of 3 hours (A Label) and less, for doors up to 4’0” (1.2m) x 10’0” (3.0m) and pairs of doors 8’0” (2.4m) x 10’0” (3.0m).

.7 Furnish locks with 2-3/4” backset, unless otherwise noted.

.8 Strikes shall be non-handed with a curved lip.

.9 Furnish extended lip strikes where required by frame/trim condition.

.10 Furnish wrought box strike cases for frames in masonry walls.

.11 Electrified locksets shall be 24VDC.

.3 Integrated Reader Locksets and Exit Devices

.1 Reader locksets shall be Sargent Harmony Series

.2 Reader locksets shall have the capability to interface directly with an open architecture Wiegand platform access control system.

.3 Locking and un-locking of the lever handle shall be electro- mechanically controlled and contained completely within the body of the lock or trim handle in the exit device.

.4 Locks to have multi-color LED to indicate reader activity.

.5 H1 type Harmony series locks and exit devices shall be provided with HID 125khz proximity reader.

.6 H2 type Harmony series locks and exit devices shall be provided with HID 13.56mhz iClass reader.

.7 Locks and exit devices shall have built-in request-to-exit switches. Furnish non-mortise lock bodies with an external door position switch. Mortise locks and mortise exit devices shall have built-in door position switches.
.8 Latchbolt monitoring is optional.
.9 Furnish all Harmony series products with Electro-lynx connectors.
.10 Mechanical platforms and rose/lever design for Harmony series products shall be as follows:

.4 Exit Devices
.1 Exit devices shall be 80 series by Sargent with ETMI lever/trim design.
.2 Exit devices shall be certified to meet or exceed the requirements of ANSI/BHMA A156.3 Grade 1.
.3 Exit devices shall be listed by Underwriters Laboratories for panic and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Exit devices for fire labelled doors shall be UL listed as Fire Exit Hardware.
.4 Exit devices shall comply with UL10C and UBC 7-2 positive pressure requirements.
.5 Furnish exit device with metal end caps which match in finish.
.6 Furnish narrow stile exit devices on doors with stiles that are less than 4-1/2” in width.
.7 Furnish exit devices with the actuating push pad extending no less than half (1/2) the width of the door.
.8 Furnish all electrified exit devices with Electrolynx plug connectors.
.9 Furnish rim type exit device on single doors.
.10 Where doors are swinging in pairs, where each leaf is independent, furnish surface vertical rod type exit devices.
.11 Where doors are swinging in pairs as dual egress, furnish surface vertical rod, less bottom rod, type exit devices.
.12 Furnish exit devices with only cylinder dogging where required on non-rated doors. Hex key dogging not acceptable.
.13 Electrified exit devices shall be 24VDC.

.5 Door Closers
.1 Door closers shall be 2800ST Cam Action, Black, Norton Assa Abloy
.2 Door closers shall comply with UL10C and UBC 7-2 positive pressure requirements.
.3 Door closers shall be certified to meet or exceed the requirements of ANSI/BHMA A156.4 grade 1.
.4 Door closers on exterior doors shall have all weather fluid.
.5 Door closers shall be adjustable to provide sizes one (1) through six (6).
.6 Door closers shall meet the requirements of ANSI A117.3 – 2003 edition Accessible and Usable Buildings and Facilities.
.7 Closing speed, latching speed, and back-check shall be controlled by hex key operated valves.
.8 Delayed action where required shall be available and controlled by a separate valve. Delayed action shall be available in addition to, not in lieu of, back-check.
.9 Furnish closers with covers. Closer covers shall be high impact plastic material of flame-retardant grade, secured by machine screws.
.10 Closers shall be non-handed.
.11 Closers shall have 2 pressure relief valves (opening and closing cycles).
.12 Furnish all special mounting plates and brackets where specified.
.13 Door closers are to be located on the room side of the door whenever possible.
,14 Furnish through bolt fasteners in all 45, 60, and 90 minute fire rated wood doors.
.15 Exposed fasters shall match the finish of the closer.
.16 Reverse bevel exterior doors shall be provided with parallel arm closers. Closers mounted on the exterior of the building will not be accepted.
.17 Furnish drop plates where door top rail size is in-sufficient and/or where overhead stop/holder interferes with the mounting of the closer.

.18 Furnish a blade stop spacer for parallel arms where soffit has in-sufficient space for parallel arm shoe mounting.

.6 Protection Plates
- .1 Kick-plates, push plates, mop plates, and armour plates shall be K1000 series by Rockwood Manufacturing.
- .2 Kick-plates, push plates, mop plates, and armour plates shall have all sides bevelled and corners rounded to ensure there are no sharp edges.
- .3 Plates shall have counter sunk screw holes, unless specified with self-adhesive tape.
- .4 Plates shall be .050 in. thick stainless steel, unless listed otherwise.
- .5 Kick-plates shall be 10 in. high or as listed in the hardware schedule.
- .6 Mop plates shall be 6 in. high or as listed in the hardware schedule.
- .7 Armour plates shall be 36 in. high or as listed in the hardware schedule.
- .8 Width of kick-plates, mop plates, and armour plates shall be the door width less 1-1/2 in. for single doors and less 1 in. for doors swinging in pairs, unless noted otherwise in the hardware schedule.
- .9 Push plates shall be 5 in. x 20 in. or as listed in the hardware schedule.
- .10 Kick-plates and mop plates shall be labelled for fire rated openings where the height of the plate is greater than 16 inches.
- .11 Where door louvers are used, the kick-plate height shall be sized accordingly.
- .12 Furnish Philips oval undercut head screws for 0.050 in. thick plates.

.7 Door Stops
- .1 Overhead Stops and Holders
  - .1 Where doors swing open, with no adjacent wall, and where a floor stop will be a tripping hazard, a #1 series overhead stop and/or holder shall be used, by Rixson.
  - .2 Overhead stops and holders shall meet or exceed the requirements of ANSI/BHMA 156.8 grade 1.
  - .3 Furnish all special mounting plates and brackets where specified.
- .2 Wall Bumpers
  - .1 Where doors swing open to adjacent walls, a wall bumper, model 240B by Gallery Specialty Hardware shall be used.
  - .2 Wall bumpers shall be concave type.
- .3 Floor Mounted Stops
  - .1 Where doors swing open, with no adjacent wall, and where overhead stops cannot be used, a floor stop shall be used, model 209 by Gallery Specialty Hardware.

.8 Thresholds and Gasketing
- .1 Thresholds
  - .1 Thresholds shall be 171 series by Pemko.
  - .2 Threshold length shall be the clear opening of door frame.
  - .3 Threshold width shall be 5” unless noted otherwise.
  - .4 Where lower rise thresholds are required, 271 series by Pemko shall be acceptable.
- .2 Gasketing
  - .1 Gasketing shall be 319 series by Pemko.
  - .2 Gasketing shall be provided to seal the complete length of the top and vertical edges of the door, applied to the door frame.
  - .3 Where smoke seal is required, gasketing shall be S88 series by Pemko.
- .3 Astragals
  - .1 Astragals shall be 357 series by Pemko.

.2 Astragals shall be 1/8" x 2" flat steel primed or clear anodized aluminum, as listed in the hardware schedule.

.4 Door Bottoms

.1 Door bottoms shall be 315 series by Pemko.

.2 Doors bottom width shall be that of the door.

.3 Automatic door bottoms for hollow metal doors shall be 420 series by Pemko.

.4 Automatic door bottoms for wood doors shall be 411 series by Pemko.

.9 Low Energy Automatic Door Operators

.1 Low Energy Automatic Door Operators shall be HA series by Ditec Entrematic.

.2 Actuating devices shall be 6" round stainless push button with handicap logo by Ditec Entrematic.

.3 Automatic Door Operators shall be in accordance with ANSI/BHMA A156.19 - Power Assist and Low Energy Operated Doors (2007).

.10 Power Supplies

.1 Power supplies shall be BPS series by Securitron.

.2 Voltage/Amperage requirements shall be as listed in the hardware schedule.

.11 Electrified Hardware Harnesses

.1 Harnesses shall be Molex Harnesses by Tillicum Agencies.

.2 Furnish Molex harnesses with all electrified hardware products. One harness shall connect the lockset/exit device to the hinge, and another harness shall connect the hinge to the junction box.

.3 Harness types and sizes shall be as listed in the hardware schedule.

## 2.04 FINISHES

.1 Hardware shall be of finishes listed in the hardware schedule.

.2 Finish shall comply with ANSI/BHMA A156.18 –Materials and Finishes.

.3 Finishes shall be as follows:

.1 Fire rated door hinges, steel base metal, 613

.2 Interior hinges, brass base metal, 613

.3 Exterior hinges, steel base metal, 613 x CPC

.4 Locks and latches, 626

.5 Exit devices, 613BE

.6 Closers, 693

.7 Protection plates, 613BE

.8 Astragals, steel, 600

.9 Astragals, aluminum, 719

.10 Flushbolts, 613BE

.11 Wall/Floor stops, 613BE

.12 Overhead stops, 613BE

.13 Thresholds, dark bronze anodized

.14 Door bottoms, dark bronze anodized

.15 Gasketing, Black

.16 Low Energy Automatic Door Operators, 613

.17 Dutch Door Bolts, 613BE

.18 Emergency Rescue Hardware, 613BE

.4 On hardware which is on the exterior side of the door including hinge barrels, exit device trims, door pulls, and locksets; furnish clear powder coat finish over the specified finish.

## 2.0 KEYING

.1 Project shall be master keyed and construction keyed.

.2 Project shall be sub-master keyed for (1) office area and (2) community centre area.

.3 All keys ad cylinder shall be Schlager.
.4 Construction key shall be lost ball system by Schlager.
.5 All keys shall be of nickel silver material.
.6 Furnish 6 construction keys.
.7 Furnish 2 change keys per cylinger.
.8 Furnish 6 master keys.
.9 Furnish 3 office area sub-master keys and 3 community centre sub-master keys.

## 3 EXECUTION

### 3.01 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

.5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.6 Install key control cabinet.

.7 Use only manufacturer's supplied fasteners.
  .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.8 Remove construction cores and locks when directed by Departmental Representative.
  .1 Install permanent cores and ensure locks operate correctly.

### 3.02 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

### 3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Leave Work area clean at end of each day.
  .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
  .3 Remove protective material from hardware items where present.
  .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.04 DEMONSTRATION

.1 Keying System Setup and Cabinet:
- .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
- .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
- .3 Lock key cabinet and turn over key to Departmental Representative.

.2 Maintenance Staff Briefing:
- .1 Brief maintenance staff regarding:
  - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
  - .2 Description, use, handling, and storage of keys.
  - .3 Use, application and storage of wrenches for door closers and locksets.

.3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

## 3.05 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

## 3.06 OPENING LIST

| Opening | Hdw Set | Fire Rating | Door Material | Frame Material |
|---|---|---|---|---|
| D1 | 1.0 | | Insulated Metal | Thermally Broken Metal |
| D2 | 2.0 | | Insulated Metal | Thermally Broken Metal |
| D3 | 3.0 | 45 | Wood Solid | Metal |
| D4 | 4.0 | 45 | Wood Solid | Metal |
| D5 | 5.0 | 45 | Wood Solid | Metal |
| D6 | 5.0 | 45 | Wood Solid | Metal |
| D7 | 6.0 | | Wood Solid | Metal |
| D8 | 7.0 | | Insulated Metal | Thermally Broken Metal |

## 3.07 FINISH LIST

| Code | Description |
|---|---|
| 630 | Satin Stainless Steel |
| US26D | Satin Chromium |
| US26D | Brass Satin Chrome Plated |
| US26D | Satin Chromium Plated |
| EN | Powder Coated to match US28 |

### 3.08 MANUFACTURER LIST

| Code | Name |
|---|---|
| FL | Fleming |
| HS | HES |
| MK | McKinney |
| OT | Other |
| PE | Pemko |
| RO | Rockwood |
| SA | SARGENT |
| SU | Securitron |

### 3.09 SCHEDULE

| | | |
|---|---|---|
| Set 1.0: Doors: D1 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Entry/Office Lock | 7G05 LL | US26D |
| 1 Surface Closer | 351 CPS | EN SA |
| 1 Threshold | 253x3AFG | PE |
| 1 Gasketing | 312CR | PE |
| 1 Sweep | 18062CNB | PE |
| 1 Astragal | 357SS 84” | PE |
| | | |
| Set 2.0: Doors: D2 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Entry/Office Lock | 7G05 LL | US26D |
| 1 Power Door Operator | DAB105 | |
| 1 Threshold | 253x3AFG | PE |
| 1 Gasketing | 312CR | PE |
| 1 Sweep | 18062CNB | PE |
| 1 Astragal | 357SS 84” | PE |
| | | |
| Set 3.0: Doors: D3 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Surface Closer | 351 UO | EN SA |
| 1 Passage Latch | U15 LL | US26D SA |
| 1 Wall Stop | 441H | US26D RO |
| 1 Gasketing | S773BL 17' | PE |
| | | |
| Set 4.0: Doors: D4 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Power Door Operator | DAB105 | |
| 1 Passage Latch | U15 LL | US26D SA |
| 1 Floor Stop | 406 | US26D RO |
| 1 Gasketing | S773BL 17’ | PE |
| | | |
| Set 5.0: Doors: D5, D6 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Surface Closer | 351 UO | EN SA |
| 1 Passage Latch | U15 LL | US26D SA |
| 1 Wall Stop | 406 | US26D RO |
| 1 Gasketing | S773BL 17’ | PE |

| | | |
|---|---|---|
| Set 6.0: Doors: D7 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Privacy Latch | 7G15 LL | US26D |
| 1 Wall Stop | 441H | US26D RO |
| 1 Gasketing | S773BL 17’ | PE |
| | | |
| Set 6.0: Doors: D8 | | |
| 1 Continuous Hinge | CFM79HD1 | PE |
| 1 Surface Closer | 351 CPS | EN SA |
| 1 Storeroom Lock | 7G04 LL | US26D |
| 1 Threshold | 253x3AFG | PE |
| 1 Astragal | 357SS 84” | PE |
| 1 Wall Stop | 406 | US26D RO |
| | | |
| Set 7.0: Doors: D9, D10 | | |
| 2 Door Pulls | RM720 | US26D |

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 542-05, Standard Specification for Lock-Strip Gaskets.
- .2 ASTM D 790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D 1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
- .4 ASTM D 1929-96 (R2001) e1, Standard Test Method for Determining Ignition Temperature of Plastics.
- .5 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E 84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .8 ASTM F 1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .9 ASTM F1915-05 Grade 3

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
- .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
- .6 CAN/CGSB-12.8-97, Insulating Glass Units.
- .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
- .8 CAN/CGSB-12.9-M91, Spandrel Glass.
- .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
- .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
- .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
- .12 CAN/CGSB-12.13-M91, Patterned Glass.

.3 Glass Association of North American (GANA)
- .1 GANA Glazing Manual - 2008.
- .2 GANA Laminated Glazing Reference Manual - 2009.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.03 CLOSEOUT SUBMITTALS**

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

**1.04 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
- .3 Protect prefinished aluminum surfaces with wrapping and strippable coating.
- .4 Replace defective or damaged materials with new.

**1.08 AMBIENT CONDITIONS**

.1 Ambient Requirements:
- .1 Install glazing when ambient temperature is -5 degrees C minimum. Maintain ventilated environment for 24 hours after application.
- .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

**2 PRODUCTS**

**2.01 MATERIALS**

.1 Design Criteria:
- .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
  - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to design pressure of 1 kPa to ASTM E330.
- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.
- .4 Wired glass: to CAN/CGSB-12.11, 6 mm thick.
  - .1 Type 1-polished both sides (transparent).
  - .2 Wire mesh styles 3-square.

.2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
  - .1 VOC limit: 5 % maximum by weight to CCD-045.
  - .2 Ensure sealant does not contain chemical restrictions to CCD-045.

## 2.02 ACCESSORIES

.1 Setting blocks: neoprene, shore "A" durometer hardness 70, 6 mm high x 100 mm long width to support full width of glass or triple glass units or as recommended by window manufacturer.

.2 Glazing Compounds: oil type to CGSB 19-GP-6 type 1-gun grade.

.3 Sealant: Silicone base, one component, to CGSB 19-GP-9 of colour to match framing. Dow-Corning 781 or approved equal.

.4 Glazing Gasket: flexible EPDM (Ethylene Propylene Dyene Monimer) rubber gasket.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C 542.

.7 Mirror attachment accessories:
- .1 Stainless steel clips.
- .2 Mirror adhesive, chemically compatible with mirror coating and wall substrate.

# 3 EXECUTION

## 3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.02 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

## 3.03 INSTALLATION: INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

.1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.

.5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm intervals, 6 mm below sight line.

.6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

.7 Trim protruding tape edge.

## 3.04 INSTALLATION: MIRRORS

.1 Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

.2 Set mirrors with clips. Anchor rigidly to wall construction.

.3 Set in frame.

.4 Place plumb and level.

## 3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
  - .1 Remove traces of primer, caulking.
  - .2 Remove glazing materials from finish surfaces.
  - .3 Remove labels.
  - .4 Clean glass and mirror] using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.06 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.
- .1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

## 3.07 SCHEDULE

.1 Refer to drawing schedules.

**END OF SECTION**

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Aluminum Association (AA)
- .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International
- .1 ASTM C 475-02 (2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 514-04 (2009e1), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C 557-03 (2009) e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .4 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.84mm to 2.84mm in Thickness.
- .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .7 ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .8 ASTM C 1280-99, Standard Specification for Application of Gypsum Sheathing.
- .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .11 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.

.3 Association of the Wall and Ceilings Industries International (AWCI)
- .1 AWCI Levels of Gypsum Board Finish-97.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.5 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish, and limitations.

## 1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store gypsum board assemblies' materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
- .3 Protect from weather, elements, and damage from construction operations.
- .4 Handle gypsum boards to prevent damage to edges, ends, or surfaces.
- .5 Replace defective or damaged materials with new.

## 1.04 AMBIENT CONDITIONS

.1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

# 2 PRODUCTS

## 2.01 MATERIALS

.1 Standard board: to ASTM C1396/C1396M regular, 12mm thick and Type X, 16mm thick, 1200 mm wide x maximum practical length, ends square cut, edges beveled.

.2 Water-resistant board: to ASTM C1396/C1396M regular, 12mm thick and 1200mm wide x maximum practical length.

.3 Metal furring runners, hangers, tie wires, inserts, anchors.

.4 Nails: to ASTM C 514.

.5 Steel drill screws: to ASTM C 1002.

.6 Stud adhesive: to ASTM C 557.

.7 Laminating compound: as recommended by manufacturer, asbestos-free.

.8 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, zinc-coated by hot-dip process, 0.5mm base thickness, perforated flanges, one piece length per location.

.9 Cornice cap: 12.7mm deep x partition width, of 1.6mm base thickness galvanized sheet steel, prime painted.

.10 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.

.11 Polyethylene: to CAN/CGSB-51.34, Type 2.

.12 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.

.13 Joint compound: to ASTM C 475, asbestos-free.

**2.02 FINISHES**

.1 Smooth finish.

**3 EXECUTION**

**3.01 EXAMINATION**

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies' installation in accordance with manufacturer's written instructions.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.02 ERECTION**

.1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.

.2 Do application of gypsum sheathing to ASTM C 1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.8 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.

.9 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.10 Furr duct shafts, beams, columns, pipes, and exposed services where indicated.

.11 Erect drywall resilient furring if required transversely across studs spaced maximum 600 mm on center and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25mm drywall screw.

.12 Install 150mm continuous strip of 12.7mm gypsum board along base of partitions where resilient furring installed.

## 3.03 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

.2 Apply layer gypsum board to metal furring or framing using screw or laminating adhesive and screw fasteners for second layer. Maximum spacing of screws 300 mm on center. Refer to wall types.

- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.
  - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250mm with base layer joints.

.3 Apply single or double layer gypsum board to concrete surfaces, where indicated, using laminating adhesive, as per drawings.

- .1 Comply with gypsum board manufacturer's recommendations.
- .2 Brace or fasten gypsum board until fastening adhesive has set.
- .3 Mechanically fasten gypsum board at top and bottom of each sheet.

.4 Apply water-resistant gypsum board where noted on drawings. Do not apply joint treatment on areas to receive panel finish (backsplash).

.5 Apply 12mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.6 Apply board using stud adhesive on furring or framing, laminating adhesive on base layer of gypsum board.

.7 Install gypsum board with face side out.

.8 Do not install damaged or damp boards.

.9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

## 3.04 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on center, using contact adhesive for full length.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Install cornice cap where gypsum board partitions do not extend to ceiling.

.6 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on center.

.7 Splice corners and intersections together and secure to each member with 3 screws.

.8 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.9 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.10 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
.1 Levels of finish:
.1 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

.11 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.12 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.13 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.14 Completed installation to be smooth, level, or plumb, free from waves and other defects and ready for surface finish.

.15 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.16 Mix joint compound slightly thinner than for joint taping.

.17 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations, or tool marks.

.18 Allow skim coat to dry completely.

.19 Remove ridges by light sanding or wiping with damp cloth.

## 3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.06 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies' installation.

**END OF SECTION**

# 1 GENERAL

## 1.01 RELATED REQUIREMENTS

.1 Section 09 21 16.

## 1.02 REFERENCE STANDARDS

.1 Environmental Protection Agency (EPA)
- .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.
- .2 SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.3 Master Painters Institute (MPI)
- .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.
- .2 Standard GPS-1-12, MPI Green Performance Standard.
- .3 Standard GPS-2-12, MPI Green Performance Standard.

.4 National Research Council Canada (NRC)
- .1 National Fire Code of Canada 2015 (NFC).

.5 Society for Protective Coatings (SSPC)
- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

## 1.03 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
- .1 Submit work schedule for various stages of painting to Departmental Representative for review. Provide schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .3 Schedule new additions to existing building coordinate painting operations with other trades.

## 1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Confirm products to be used are in MPI's approved product list.

.3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
- .1 Product name, type, and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.
- .4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Material Safety Data Sheets (MSDS).

.4 Samples:
.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.5 Certificates: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.

.7 Manufacturer's Instructions:
.1 Provide manufacturer's installation and application instructions.

## 1.05 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.

.3 Include:
.1 Product name, type, and use.
.2 Manufacturer's product number.
.3 Colour numbers.
.4 MPI Environmentally Friendly classification system rating.

## 1.06 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Submit one four-litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

## 1.07 QUALITY ASSURANCE

.1 Qualifications:
.1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.
.2 Conform to latest MPI requirements for exterior painting work including preparation and priming.
.3 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
.4 Retain purchase orders, invoices, and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
.5 Standard of Acceptance:
.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
.2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

## 1.08 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer’s written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer’s name and address.

.1 Labels: to indicate:
.1 Type of paint or coating.
.2 Compliance with applicable standard.
.3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Observe manufacturer's recommendations for storage and handling.
.3 Store materials and supplies away from heat generating devices.
.4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
.5 Keep areas used for storage, cleaning, and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
.6 Remove paint materials from storage only in quantities required for same day use.
.7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
.8 Fire Safety Requirements:
.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
.2 Store oily rags, waste products, empty containers, and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada (NFC).

## 1.09 SITE CONDITIONS

.1 Ambient Conditions:
.1 Heating, Ventilation and Lighting:
.1 Ventilate enclosed spaces in accordance with Division 23.
.2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
.3 Provide continuous ventilation for 7 days after completion of application of paint.
.4 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
.6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
.7 Temperature, Humidity and Substrate Moisture Content Levels:
.1 Unless pre-approved written approval by product manufacturer, perform no painting when:
.1 Ambient air and substrate temperatures are below 10 degrees C.
.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 12% for plaster and gypsum board.

.8 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.9 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

## 2 PRODUCTS

### 2.01 MATERIALS

.1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.4 Conform to latest MPI requirements for interior painting work including preparation and priming.

.7 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:

.1 Be Water-based, Water soluble, Water clean-up.

.2 Be non-flammable.

.3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.4 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

### 2.02 COLOURS

.1 Colour schedule will be based upon selection of 1 base colour

.2 Interior finish selection of colours will be from manufacturers full range of colours by architect.

.3 Exterior finish selection of colours will be from manufacturers full range of colour, to match existing colour and paint type, colour to be approved by PM prior to purchase.

.4 Where specific products are available in restricted range of colours, selection based on limited range.

.5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats, if requested by Departmental Representative.

.6 For deep and ultra-deep colours; 4 coats may be required.

## 2.03 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.

.2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer’s recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer’s instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

## 2.04 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

| | Gloss @ 60 degrees | Sheen @ 85 degrees |
|---|---|---|
| Gloss Level 1 - Matte Finish (flat) | Max. 5 | Max. 10 |
| Gloss Level 2 - Velvet-Like Finish | Max.10 | 10 to 35 |
| Gloss Level 3 - Eggshell Finish | 10 to 25 | 10 to 35 |
| Gloss Level 4 - Satin-Like Finish | 20 to 35 | min. 35 |
| Gloss Level 5 - Traditional Semi-Gloss Finish | 35 to 70 | |
| Gloss Level 6 - Traditional Gloss | 70 to 85 | |
| Gloss Level 7 - High Gloss Finish | More than 85 | |

.2 Gloss level ratings of painted surfaces as noted on Finish Schedule.

## 2.05 INTERIOR PAINTING SYSTEMS

.1 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
- .1 INT 5.3A - Latex insert gloss over cementitious primer finish.
- .2 INT 5.3C – W.B semi-gloss finish over cementitious primer.

.2 Drywall Ceilings
- .1 INT 9.1A - Latex flat finish spray application only.

.3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
- .1 INT 9.2C - Alkyd eggshell finish (over latex primer/sealer).
- .2 INT 9.2CC - Alkyd, W.B. semi-gloss finish for wet locations.

## 2.06 EXTERIOR PAINTING SYSTEMS

.1 Wood Panelling: T&G Cedar siding.
- .1 Contractor to provide colour and paint type to match existing exterior paint. Architect to approve finish before purchase

# 3 EXECUTION

## 3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

## 3.02 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

## 3.03 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.04 PREPARATION

.1 Protection (not applicable to new painting work):
- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect building occupants in and about the building.

.2 Surface Preparation:
- .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings, and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual regarding specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
- .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil, and other surface contaminants.
- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .4 Allow surfaces to drain completely and allow to dry thoroughly.
- .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
- .1 Apply sealer to MPI #36 over knots, pitch, sap, and resinous areas.
- .2 Apply wood filler to nail holes and cracks.
- .3 Tint filler to match stains for stained woodwork.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Carried out during shop priming: clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease, and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets, and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air or vacuum cleaning.

.8 Touch up of shop primers with primer as specified.

## 3.05 EXISTING CONDITIONS

.1 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.2 Maximum moisture content as follows:
- .1 Stucco: 12%.
- .2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.
.4 Hard Wood: 15%.
.5 Soft Wood: 17%.

## 3.06 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants and general public in and about building.

.5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings, and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas as required.

## 3.07 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, air sprayer or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
.1 Apply paint in uniform layer using brush and/or roller type suitable for application.
.2 Work paint into cracks, crevices, and corners.
.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:
.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
.4 Brush out immediately all runs and sags.
.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins, or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges, and cutouts of doors after fitting as specified for door surfaces.

.12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

## 3.08 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork, and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork, and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork, and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Do not paint over nameplates.

.5 Paint inside of ductwork where visible behind grilles, registers, and diffusers with primer and one coat of matt black paint.

.6 Paint fire protection piping red.

.7 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.8 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.9 Do not paint interior transformers and substation equipment.

## 3.09 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

## 3.10 FIELD QUALITY CONTROL

.1 Standard of Acceptance:
- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

## 3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

## 3.12 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashes on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing, and handling of paint to clean condition as approved by Departmental Representative.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 National Fire Protection Agency (NFPA)

.1 NFPA 10-13 – Standard for Portable Fire Extinguishers

# 2 PRODUCTS

## 2.1 HANDHELD FIRE EXTINGUISHERS - GENERALLY

.1 Provide handheld fire extinguishers rated in accordance with CAN/ULC S508-1990, Extinguishers, fire, Rating and Fire Testing of Fire Extinguishers and bearing ULC label.

## 2.2 HANDHELD FIRE EXTINGUISHERS

.1 Multi-Purpose Dry Chemical - Pressure Type:

.1 Description: ammonium phosphate, powder type, heavy duty steel cylinder, baked enamel finish, squeeze grip handle with positive on/off valve, hose and nozzle, mounting brackets.

.2 Capacity: 5 kg.

.3 Classification: Class A, B, and C fires.

## 2.3 FIRE EXTINGUISHER CABINETS

.1 Fire Extinguisher Cabinet: cabinet tub formed of minimum 1.6 mm steel. Door and adjustable frame are fabricated with minimum 2.5 mm steel corrosion resistant treated, prime coated.

.2 Semi-recessed with transparent canopy door.

# 3 EXECUTION

## 3.1 INSTALLATION

.1 Install fire extinguisher cabinet with top of cabinet 1.5 m above floor.

.2 Provide extinguishers of the type listed for the following areas.

.1 Mechanical rooms: multi-purpose dry chemical.
.2 Kitchen: Type K multi-purpose dry chemical.
.3 Office Corridors: multi—purpose dry chemical.

.3 Provide extinguishers were indicated on drawings.

.4 Where exact location is not indicated, mount in location as directed by the Office of the Fire Marshall.

**END OF SECTION**

# 1 GENERAL

## 1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all plumbing fixtures, valves, and other plumbing specialities.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.3 In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

## 1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data

.1 Operation and maintenance manual approved by, and final copies deposited with Department Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Department Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right-hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Department Representative for approval and make corrections as directed.

.4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

## 1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease, and adapters to suit different types of grease and grease fittings.

**1.4 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative and Departmental Representative.

**3.2 PAINTING REPAIRS AND RESTORATION**

.1 Do painting in accordance with Section 09 91 23- Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

## 3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

## 3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting, and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

## 3.5 DEMONSTRATION

.1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Departmental Representative will record these demonstrations on video tape for future reference.

## 3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11- Cleaning.

## 3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

# 1 GENERAL

## 1.1 SUMMARY

.1 This Section includes requirements for selective demolition and removal of plumbing, and related mechanical components and incidentals required to complete the proposed work as shown on the drawings.

## 1.2 RELATED REQUIREMENTS

.1 Section 02 41 16– Structure Demolition

.2 Section 02 41 19.13– Selective Building Demolition

.3 Section 02 41 19.16– Selective Interior Demolition

.4 Section 02 42 00– Removal and Salvage of Construction Materials

## 1.3 REFERENCE STANDARDS

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Canadian Standards Association (CSA):

.1 CSA S350, Code of Practice for Safety in Demolition of Structures.

## 1.4 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following in accordance with Section 01 33 00– Submittal Procedures before starting work of this Section:

.1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19– Construction Waste Management and Disposal.

.2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes and recycling. All certificates, receipts and recycling attestations are to be gathered in CWM plan binder.

## 1.6 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

## 1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with the following:

.1 Provincial/Territorial Workers' Compensation Boards/Commissions

.2 Government of Canada, Labour Program: Workplace Safety

## 1.8 SITE CONDITIONS

.1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed on date that tender is accepted.

.2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Department Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:

.1 Refer to Section 01 41 00– Regulatory Requirements for directives associated with specific material types.

.2 Hazardous substances will be as defined in the Hazardous Products Act.

.3 Stop work in the area of the suspected hazardous substances.

.4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.

.5 Proceed only after written instructions have been received from Department Representative.

# 2 PRODUCTS

## 2.1 (NOT USED) (REPAIR MATERIALS)

.1 General Patching and Repair Materials: Refer to Division 02 for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.

.2 Plumbing Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials

are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.

.3 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

**2.2 (SALVAGE AND) DEBRIS MATERIALS**

.1 Material Ownership: Demolished materials become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Department Representative's property.

.2 Salvaged Materials: Carefully remove materials designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 42 00.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Department Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

**3.2 PREPARATION**

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify Department Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that must remain in operation.

**3.3 EXECUTION**

.1 Demolition: Coordinate requirements of this Section with information contained in Division 02 and as follows:

.1 Disconnect and cap mechanical services in accordance with requirements of local Authority Having Jurisdiction.

.2 Do not disrupt active or energized utilities without approval of the Department Representative.

.3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.

.4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.

.5 At end of each day's work, leave worksite in safe condition.

.6 Perform demolition work in a neat and workmanlike manner:

.1 Remove any tools or equipment after completion of work and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

## 3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re-use in new construction in accordance with Section 02 42 00.

.2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with Local and National regulations.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

- .1 ASTM A126-04(2019), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)

- .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 ANSI/AWWA C701-12, Standard for Cold Water Meters-Turbine Type for Customer Service.
- .3 ANSI/AWWA C702-19, Standard for Cold Water Meters-Compound Type.

.3 CSA Group (CSA)

- .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
- .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
- .3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Efficiency Valuation Organization (EVO)

- .1 International Performance Measurement and Verification Protocol (IPMVP).
  - .1 IPMVP 2020 Version.

.5 National Research Council Canada (NRC)

- .1 National Plumbing Code of Canada 2015 (NPC).

.6 Plumbing and Drainage Institute (PDI)

- .1 PDI-G101-R2017, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
- .2 PDI-WH201-R2017, Water Hammer Arresters Standard.

## 1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings:

- .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Departmental Representative in accordance with Section 01 31 19- Project Meetings to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building construction subtrades.
  - .4 Review manufacturer's written installation instructions and warranty requirements.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements. Indicate VOC's.

.3 Shop Drawings:

.1 Indicate on drawings to indicate method of anchorage, dimensions, materials, accessories, number of anchors, construction and assembly details, finishes, for all plumbing fixtures and accessories.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturers' Field Reports: manufacturers' field reports specified.

**1.4 CLOSEOUT SUBMITTALS**

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

**1.5 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect plumbing materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**2 PRODUCTS**

**2.1 FLOOR DRAINS**

.1 Floor Drains and Trench Drains: to CSA B79.

.2 Type 1: general duty; cast iron body as indicated, adjustable head, nickel bronze strainer, integral seepage pan, and clamping collar.

.3 Type 2: heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.

.4 Type 3: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

.5 Type 4: planters; cast-iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer, vandal-proof dome and standpipe, stainless steel screen.

.6 Type 5: waste oil; heavy duty cast iron body with sediment bucket, vent connection, checkered plate and bronze plug.

.7 Type 6: epoxy coated trench drain with stainless steel grate, anchor flanges, membrane clamps.

## 2.2 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access Covers:

.1 Wall Access: face or wall type, round polished nickel bronze cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor Access: cast iron body and frame with adjustable secured nickel bronze, round and:

.1 Plugs: bolted bronze with neoprene gasket.

.2 Cover for Unfinished Concrete Floors: round, nickel bronze gasket, vandal-proof screws.

.3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.

.4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

## 2.3 WALL HYDRANTS

.1 Surface type with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Chrome plated finish.

## 2.4 WATER HAMMER ARRESTORS

.1 Copper construction, bellows type: to PDI-WH201.

## 2.5 BACK FLOW PREVENTERS

.1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type, double check valve assembly.

## 2.6 VACUUM BREAKERS

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

## 2.7 PRESSURE REGULATORS

.1 Capacity: as indicated.

.1 Inlet pressure: 1034 kPa.

.2 Outlet pressure: 413 kPa.

.2 Up to NPS 1-1/2 bronze bodies, screwed: to ASTM B62.

.3 NPS 2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.

.4 Semi-steel spring chambers with bronze trim.

## 2.8 BACKWATER VALVES

.1 Galvanized body with bronze seat, revolving bronze flapper and threaded cover.

.2 Access:

.1 Surface access.

.2 Access pipe with cover: maximum 300 mm depth.

.3 Steel housing with gasketted steel cover.

.4 Concrete access pit with cover, as indicated.

## 2.9 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

## 2.10 WATER MAKE-UP ASSEMBLY

.1 Complete with backflow preventer pressure gauge on outlet, pressure reducing valve to CAN/CSA-B356, pressure relief valve on low pressure side and gate valves on inlet and outlet.

## 2.11 WATER METERS

.1 Displacement type to ANSI/AWWA C700.

.2 Capacity: as indicated.

.3 Accessories: remote readout device.

## 2.12 TRAP SEAL PRIMERS

.1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.

## 2.13 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS 2 and under, bronze body, screwed ends, with brass cap.

.3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialities and accessories installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### 3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### 3.3 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada (NPC) and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

### 3.4 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

### 3.5 NON-FREEZE WALL HYDRANTS

.1 Install 600 mm above finished grade and as indicated.

### 3.6 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

### 3.7 BACK FLOW PREVENTERS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.1 Drains.

.2 Backwater Valves.

.3 Water Make-up Assembly.

.4 Grease Interceptors.

.2 Pipe discharge to terminate over nearest drain.

**3.8 BACKWATER VALVES**

.1 Install where indicated.

**3.9 HOSE BIBBS AND SEDIMENT FAUCETS**

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

**3.10 TRAP SEAL PRIMERS**

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Department Representative.

.3 Install plastic tubing to floor drain.

**3.11 STRAINERS**

.1 Install with sufficient room to remove basket for maintenance.

**3.12 GREASE INTERCEPTORS**

.1 Install with sufficient space, as indicated, for maintenance.

**3.13 WATER METERS**

.1 Install water metre provided by local water authority.

.2 Install water metre as indicated.

**3.14 WATER MAKE-UP ASSEMBLY**

.1 Install on valved bypass.

.2 Pipe discharge from relief valve to nearest floor drain.

**3.15 START-UP**

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified herein.

.2 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

**3.16 TESTING AND ADJUSTING**

.1 General:

.1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13- General Commissioning Requirements: General Requirements, supplemented as specified.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removability of strainer.

.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.7 Roof drains:

.1 Check location at low points in roof.

.2 Check security, removability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

.8 Access doors:

.1 Verify size and location relative to items to be accessed.

.9 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.10 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.11 Wall, ground hydrants:

.1 Verify complete drainage, freeze protection.

.2 Verify operation of vacuum breakers.

.12 Pressure regulators, PRV assemblies:

.1 Adjust settings to suit locations, flow rates, pressure conditions.

.13 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

.14 Grease interceptors:

.1 Activate, using manufacturer's recommended procedures and materials.

.15 Hose bibbs, sediment faucets:

.1 Verify that flow and pressure meet design criteria.

.2 Check for leaks, replace compression washer if required.

.16 Hydronic system water Make-up Assembly:

.1 Verify flow, pressure, and connection.

.17 Water meters:

.1 Verify location and accessibility.

.2 Test metre reading accuracy.

## 3.17 CLOSEOUT ACTIVITIES

.1 Commissioning Reports: in accordance with Section 01 91 13- General Commissioning Requirements: reports, supplemented as specified.

.2 Training: provide training in accordance with Section 01 91 13- General Commissioning Requirements: Training of O&M Personnel, supplemented as specified.

## 3.18 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

## 3.19 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers International (ASME)

.1 ANSI/ASME B16.15-13, Cast Cooper Alloy Threaded Fittings, Classes 125 and 250.

.2 ASME B31.9-14, Building Services Piping.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 National Research Council (NRC)

.1 National Plumbing Code of Canada (NPC) 2015.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

## 1.3 QUALITY ASSURANCE

.1 Qualifications:

.1 Welders:

.1 Welding qualifications in accordance with CSA B51.

.2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.

.3 Submit welder's qualifications to Department Representative.

.4 Each welder to possess identification symbol issued by authority having jurisdiction.

.5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.

.2 Inspectors:

.1 Inspectors qualified to CSA W178.2.

.3 Certifications:

.1 Registration of welding procedures in accordance with CSA B51.

.2 Copy of welding procedures available for inspection.

.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

## 2 PRODUCTS

### 2.1 MATERIALS

.1 Materials and resources in accordance with Section 01 47 15- Sustainable Requirements: Construction.

### 2.2 BILGE AND SEWAGE PUMP

.1 Capacity: 2.5L/s at 4m of head.

.2 Construction: simplex, vertical extended shaft, single stage centrifugal, designed to handle 25 mm solids and for sump depth 78mm, plastic housing, with sealed plastic cover.

.3 Motor: 1.0hp, 120V / 60hz, drip-proof, with overload and under voltage protection.

.4 Control: Integral ball float operated heavy duty switch. Alarm control panel with indicators.

.5 Alarm: powered audible and visual alarm located as indicated, controlled by float or pressure operated switch.

.6 Sump: fibreglass reinforced plastic one piece, to manufacturers standard, with heavy bituminous seals.

## 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### 3.2 INSTALLATION

.1 Make piping and electrical connections to pump and motor assembly and controls as indicated.

.2 Ensure pump and motor assembly do not support piping.

.3 Align vertical pit mounted pump assembly after mounting and securing cover plate.

.4 Coordinate for structure and envelope to have sufficient insulation under sump pit tank.

### 3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Check power supply.

.2 Check starter protective devices.

.2 Start-up, check for proper and safe operation.

.3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

.4 Adjust flow from water-cooled bearings.

.5 Adjust impeller shaft stuffing boxes, packing glands.

## 3.4 START-UP

.1 General:

.1 In accordance with Section 01 91 13- GENERAL COMMISSIONING REQUIREMENTS: General Requirements, supplemented as specified herein.

.2 Procedures:

.1 Check power supply.

.2 Check starter O/L heater sizes.

.3 Start pumps, check impeller rotation.

.4 Check for safe and proper operation.

.5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.

.6 Test operation of hands-on-auto switch.

.7 Test operation of alternator.

.8 Adjust leakage through water-cooled bearings.

.9 Adjust shaft stuffing boxes.

.10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.

.11 Check base for free-floating, no obstructions under base.

.12 Run-in pumps for 12 continuous hours.

.13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

.14 Adjust alignment of piping and conduit to ensure full flexibility.

.15 Eliminate causes of cavitation, flashing, air entrainment.

.16 Measure pressure drop across strainer when clean and with flow rates as finally set.

.17 Replace seals if pump used to degrease system or if pump used for temporary heat.

.18 Verify lubricating oil levels.

## 3.5 SUMP PUMPS

.1 Application tolerances:

.1 Flow: Matched to connected to fixture flow rate.

.2 PV Procedures:

.1 Fill sump at rate equal to connected fixture flow rates.

.2 Record levels at which pumps start and stop - water level rising and water level falling.

.3 Adjust water level controls as necessary.

.4 Fill sump at rate faster than capacities of pumps #1.

.5 Record levels at pump starts and stops - water level rising and falling.

.6 Check operation of alternator.

.7 Adjust level controls as necessary.

.8 Check level at which high water level alarm starts and stops. Adjust as necessary.

.3 Check removability of pumps for servicing without interfering with installation or operation of other equipment.

.4 Verify non-clog capability and maximum size of solids, using procedures recommended by manufacturer.

## 3.6 REPORTS

.1 In accordance with Section 01 91 13- GENERAL COMMISSIONING REQUIREMENTS: reports, supplemented as specified.

.2 Include:

.1 PV results on approved PV Report Forms.

.2 Product Information report forms.

.3 Pump performance curves (family of curves) with final point of actual performance.

## 3.7 TRAINING

.1 In accordance with Section 01 91 13- GENERAL COMMISSIONING REQUIREMENTS: Training of O&M Personnel, supplemented as specified.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers International (ASME)

- .1 ANSI/ASME B16.15-13, Cast Cooper Alloy Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-11, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
- .5 ASME B16.26-13, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .6 ASME B31.9-14, Building Services Piping.
- .7 ASME B36.19M-04, Stainless Steel Pipe.

.2 ASTM International (ASTM)

- .1 ASTM A182/A 182M-16, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
- .2 ASTM A269-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 ASTM A312/A312M-16, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- .5 ASTM A351/A351M-16, Castings, Austenitic, for Pressure Containing Parts.
- .6 ASTM A403/A403M-16, Wrought Austenitic Stainless Steel Piping Fittings.
- .7 ASTM A536-84(2014), Standard Specification for Ductile Iron Castings.
- .8 ASTM B32-08(2014), Standard Specification for Solder Metal.
- .9 ASTM B42-15a, Seamless Copper Tube, Standard Sizes.
- .10 ASTM B88M-14, Standard Specification for Seamless Copper Water Tube (Metric).
- .11 ASTM F876-15, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
- .12 ASTM F877-11, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.

.3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

- .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 ANSI/AWWA C151/A21.51-09, Ductile Iron Pipe, Centrifugally Cast, for Water.
- .3 AWWA C904-06, Crosslinked Polyethylene (PEX) Pressure Pipe, ½ In. (12 mm) through 3 In. (76mm), for Water Service.

.4 CSA Group (CSA)

.1 CSA B137.5-13, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.

.2 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S101-07, Fire Endurance Tests of Buildings Construction and Materials.

.2 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

.3 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop.

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02a, Butterfly Valves.

.2 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)

.1 National Plumbing Code of Canada (NPC) 2015.

.10 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 47 15- Sustainable Requirements: Construction.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, and Regional and Municipal regulations.

## 2 PRODUCTS

### 2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground:

.1 Copper tube, hard drawn, type L: to ASTM B88M.

.2 PEX Piping to CSA B137.5.

.2 Buried or embedded:

.1 Copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

.2 PEX Piping to CSA B137.5.

### 2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger:

.1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.2 PEX fittings to CSA B137.5 and F1960.

.6 NPS 1 ½ and smaller:

.1 cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

.2 PEX fittings to CSA B137.5.

### 2.3 JOINTS

.1 Rubber gaskets, 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

.7 NPS 1 ½ and smaller: PEX fittings to CSA B137.5.

.8 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves.

## 2.4 GATE VALVES

.1 NPS 2 and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01- Valves - Bronze.

.2 NPS 2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01- Valves - Bronze.

.3 NPS 2 1/2 and over, in mechanical rooms, flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23.02- Valves - Cast Iron.

.4 NPS 2 1/2 and over, other than mechanical rooms, flanged:

.1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section 23 05 23.02- Valves - Cast Iron: Gate, Globe, Check.

## 2.5 GLOBE VALVES

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23.01- Valves - Bronze.

.2 Lockshield handles: as indicated.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23.01- Valves - Bronze.

.2 Lockshield handles: as indicated.

## 2.6 SWING CHECK VALVES

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01- Valves - Bronze.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01- Valves - Bronze.

.3 NPS 2 1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 23.02- Valves - Cast Iron: Gate, Globe, Check.

## 2.7 BALL VALVES

.1 NPS 2 and under, screwed:

.1 Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01- Valves - Bronze.

.2 NPS 2 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01- Valves - Bronze.

.3 NPS 2 and under, mechanical:

.1 To CSA B137.5 and ASTM F1960.

.2 Lead free brass body.

**2.8 BUTTERFLY VALVES**

.1 NPS 2-1/2 and over:

.1 To MSS-SP-67, Class 200.

.2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.

.3 Lever operated.

.2 NPS 2-1/2 and over, grooved ends:

.1 Class 300 psig CWP, bubble tight shut-off, bronze body EPDM coated ductile iron disc with integrally cast stem.

.2 Operator:

.1 NPS 4 and under: lever handle.

.2 NPS 6 and over: gear operate

**3 EXECUTION**

**3.1 APPLICATION**

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

.1 Install in accordance with local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 15- Common Installation Requirements for HVAC Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.

.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Buried tubing:

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

.7 Valves

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

## 3.3 PRESSURE TESTS

.1 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

## 3.4 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Alberta potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

## 3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

## 3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to approval of Department Representative.

.2 Coordinate with Section 33 11 16- Site Water Utility Distribution Piping and Section 33 11 16.01- Incoming Site Water Utility Distribution Piping.

.3 Upon completion, provide laboratory test reports on water quality for Department Representative approval.

## 3.7 START-UP

.1 Timing: start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Bring HWS storage tank up to design temperature slowly.

.4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.

.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

## 3.8 PERFORMANCE VERIFICATION

.1 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB HWC in accordance with Section 23 05 93- Testing, Adjusting and Balancing for HVAC.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize HWS and HWC systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 13- General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13- General Commissioning (Cx) Requirements: Report Forms and Schematics.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

## 3.9 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including cleaning and maintenance of specified materials and products with Section 23 05 15- Common Installation Requirements for HVAC Pipework.

.2 Operational requirements in accordance with Section 01 47 19- Sustainable Requirements: Operation, include:

.1 Cleaning materials and schedules.

.2 Repair and maintenance materials and instructions.

## 3.10 CLEANING

.1 Clean in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM D2235- 04, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.2 ASTM D2564- 04e1, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 CSA Group (CSA)

.1 CAN/CSA-Series B1800- 06, Thermoplastic Non pressure Pipe Compendium - B1800 Series.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06- Health and Safety Requirements.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Store at temperatures and conditions recommended by manufacturer.

# 2 PRODUCTS

## 2.1 PIPING AND FITTINGS

.1 For buried DWV piping to:

.1 CAN/CSA B1800.

**2.2 JOINTS**

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

**3 EXECUTION**

**3.1 APPLICATION**

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

.1 In accordance with Section 23 05 15- Common installation requirements for HVAC pipework.

.2 Install in accordance with National Plumbing Code.

**3.3 TESTING**

.1 Pressure test concealed systems before enclosing.

.2 Hydraulically test to verify grades and freedom from obstructions.

**3.4 PERFORMANCE VERIFICATION**

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

**3.5 CLEANING**

.1 Clean in accordance with Section 01 74 00- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA B51-03(R2007), Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CAN/CSA-C309-M90(R2003), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

.2 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

## 1.2 WARRANTY

.1 For the Work of this Section the existing equipment is to be assumed to be in good working condition, no implied warranty is to be provided for existing equipment, however any damage to existing equipment will be the responsibility of the Contractor to repair, and workmanship of connections and piping to the hot water heating equipment is to be in compliance with Division 01 requirements.

## 1.3 STORAGE AND HANDLING

.1 Relocation storage and relocation: provide adequate temporary protection to ensure during construction water heater will have sufficient protection during demolition and relocation to avoid further damage or reduce the existing equipment remaining life span.

.2 Storage and Handling Requirements:

.1 Record the initial condition for review by the Department Representative prior to disconnection for verification by Department Representative with final installed condition.

.2 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.3 Store and protect from additional nicks, scratches, and blemishes.

.4 Replace damaged materials with new.

# 2 PRODUCTS

## 2.1 WATER HEATER

.1 Existing water heater to be reused:

.1 Supply new direct venting kit for use with the existing water heater, approved by the manufacturer.

## 3 EXECUTION

### 3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

### 3.2 FIELD QUALITY CONTROL

.1 Manufacturer's factory trained, certified contractor start-up and commission DHW heaters.

### 3.3 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures, (Consists of B45.0, B45.1, B45.2, B45.3, B45.4, B45.5, B45.6, B45.7, B45.8 and B45.9).

.2 CSA B125.3-12, Plumbing Fittings.

.3 CSA B651-12, Accessible Design for the Built Environment.

.2 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

.3 South Coast Air Quality Management District (SCAQMD)

.1 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for washroom fixtures and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Indicate fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Factory-set water consumption per flush at recommended pressure.

.3 (For water closets, urinals): minimum pressure required for flushing.

## 1.3 CLOSEOUT SUBMITTALS

.1 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect specified materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

## 2 PRODUCTS

### 2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CSA B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: as indicated.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Water Closet Flush Valves:

.1 Flush valve: exposed, polished chrome, externally adjustable, diaphragm type with NPS 1 screwdriver angle stop, oscillating handle, flush connection and coupling for NPS 1 1/2 top spud, wall and spud escutcheons and vacuum breaker.

.8 Electronic Water Closet Flush Valves:

.1 Barrier-free, stainless steel, electronic, sensor proximity type, activated by infra-red.

.2 Sensor: waterproof, with impact-resistant, anti scratch coated plastic lens, sensitivity adjustable from 100 mm to 450 mm.

.3 Water conservation: 30 second maximum run time.

.4 Controls: interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, single 12 VDC, slow-closing commercial solenoid for 860 kPa, 85 degrees C.

.5 Transformer: 120/12 VDC, UL and CSA listed, hardwire type, sized for up to 8 solenoids.

.6 Equipped with manual override button.

.9 Water Closet Seats.

.1 Seat: white, elongated, open front, moulded solid plastic, less cover, stainless steel check hinges, stainless steel insert post.

.10 Washroom Lavatory Trim:

.1 Chrome plated brass, combination supply and waste fittings, mixing spout, washerless, pop-up waste, aerator, metal indexed handles.

.1 Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.

.2 Waste fitting: pop-up.

.2 Wheelchair supply fitting with gooseneck spout, aerator, 150 mm blade handles with indexed buttons, bent tailpiece.

.1 Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.

.2 Waste fitting: pop-up.

.11 Washroom Lavatory Electronic Trim:

.1 Barrier-free electronic faucet:

.1 Infra-red motion sensor activated by hand motion in lavatory.

.2 Sensor: waterproof, incorporated in body of unit, with impact-resistant plastic lens and anti-scratch coating, [inside spout, sensitivity adjustable from 100 mm to 450 mm.

.3 Water conservation: 30 second maximum run time.

.4 Controls: vandal-proof, interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, single 24 VAC slow-closing commercial solenoid for 860 kPa, 85 degrees C.

.5 Transformer: 120/12 VDC Class 2, UL and CSA listed, hard wire type, sized for up to 8 solenoids.

.6 Spout: Chrome plated, with integral flow control aerator rated at 8.35 l/minute at 413 kPa maximum.

.7 Under-counter temperatures mixing controls.

.12 Fixture piping:

.1 Hot and cold water supplies to fixtures:

.1 Chrome plated flexible supply pipes with handwheel stop, reducers, escutcheon.

.2 Waste:

.1 Brass P trap with clean out on fixtures not having integral trap.

.2 Chrome plated in exposed places.

.13 Chair carriers:

.1 Factory manufactured floor-mounted carrier systems for wall-mounted fixtures.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for washroom fixtures installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### 3.2 INSTALLATION

.1 Mounting heights:

.1 Standard: as indicated.

.2 Wall-hung fixtures: as indicated.

.3 Barrier-free: to most stringent CSA B651, NBC.

## 3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

- .1 Adjust water flow rate to design flow rates.
- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Adjust flush valves to suit actual site conditions.
- .4 Adjust urinal flush timing mechanisms.
- .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.

.3 Checks:

- .1 Water closets, urinals: flushing action.
- .2 Aerators: operation, cleanliness.
- .3 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:

- .1 Verify temperature settings, operation of control, limit and safety controls.

## 3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

.2 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

## 1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data in accordance with Section 01 78 00- Closeout Submittals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

# 2 PRODUCTS

## 2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures to be product of one manufacturer.

.6 Trim to be product of one manufacturer.

.7 Service sinks:

.1 Sink: acid-resisting porcelain enamelled cast iron, roll rim, with 300 mm high undrilled integral back. Size: 559 x 457 x 300 mm.

.2 Supply fitting: with vacuum breaker, indexed cross handles, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves. Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.

.3 Waste fitting: chrome plated cast brass outlet strainer, enamelled cast iron trap standard with brass cleanout and adjustable floor flange.

.4 Rim guard: stainless steel, continuous on three sides.

.5 Barrier free, stainless steel, electronic, sensor proximity type, activated by infra-red.

.1 Sensor: waterproof, with impact-resistant, anti scratch coated plastic lens, sensitivity adjustable from 100 mm to 450 mm.

.2 Water conservation: 30 second maximum run time.

.3 Controls: interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, single 24 VAC, slow-closing commercial solenoid for 860 kPa, 85 degrees C.

.4 Transformer: 120/24 VCA, Class 2, UL and CSA listed, hardwire type, sized for up to 8 solenoids.

.5 Equipped with manual override button.

.8 Mop sinks:

.1 Sink: acid-resisting porcelain enamelled cast iron, 300 mm high undrilled integral back. Size: 610 x 610 x 254 mm.

.2 Supply fitting: with built-in elevated vacuum breaker, indexed cross handles, 1400 mm long rubber hose, escutcheons, union inlets, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves. Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.

.9 Stainless steel countertop sinks.

.1 SC-1: single compartment, ledge back.

.1 From 1.0 mm thick type 302 stainless steel, self-rimming, undercoated, clamps. Inside sizes: 508 x 508 x 203 mm.

.2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, with spray fitting.

.3 Barrier free, stainless steel, electronic, sensor proximity type, activated by infra-red.

.1 Sensor: waterproof, with impact-resistant, anti scratch coated plastic lens, sensitivity adjustable from 100 mm to 450 mm.

.2 Water conservation: 30 second maximum run time.

.3 Controls: interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, single 24 VAC, slow-closing commercial solenoid for 860 kPa, 85 degrees C.

.4 Transformer: 24 VCA, Class 2, UL and CSA listed, hardwire type, sized for up to 8 solenoids.

.2 SC-2: double compartment, ledge back:

.1 From 1.0 mm thick type 302 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 790 x 520 x 180 mm.

.2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting.

.3 Barrier free, swivel stainless steel, electronic, sensor proximity type, activated by infra-red.

.1 Sensor: waterproof, with impact-resistant, anti scratch coated plastic lens, sensitivity adjustable from 100 mm to 450 mm.

.2 Water conservation: 30 second maximum run time.

.3 Controls: interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, single 24 VAC, slow-closing commercial solenoid for 860 kPa, 85 degrees C.

.4 Transformer:24 VAC, Class 2, UL and CSA listed, hardwire type, sized for up to 8 solenoids.

.5 Equipped with manual override button.

.4 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.

.10 Fixture piping:

.1 Hot and cold water supplies to each fixture:

.1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.

.2 Waste:

.1 Brass P trap with clean out on each fixture not having integral trap.

.2 Chrome plated in all exposed places.

.11 Chair carriers:

.1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

## 3 EXECUTION

### 3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.2 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: as indicated, measured from finished floor.

.3 Physically handicapped: to comply with most stringent of either NBC or CAN/CSA-B651.

## 3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

## 3.4 CLEANING

.1 Clean in accordance with Section 01 74 11- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

.2 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

## 1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data in accordance with Section 01 78 00- Closeout Submittals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

# 2 PRODUCTS

## 2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Baths:

.1 BT-1 : recessed tub.

.1 Stain-resisting, porcelain enamelled steel, with non-slip surface

.2 Waste: concealed pop-up waste and overflow fitting with lever-operated mechanism.

.3 Trim: chrome plated brass combination shower and over-rim bath supply fittings with volume control, mixing valve, screwdriver stops, self-returning diverter spout, chrome plated ball joint fully adjustable spray pattern shower head with bent shower arm and escutcheon. Provide accessories to limit maximum flow rate to 9.5 litres/minute at 550 kPa.

.4 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.

.8 Individual shower stall showerhead.

.1 SH-1: individual showerhead.

.1 Chrome plated brass, non-clog, with adjustable spray, ball joint, standard chrome plated bent arm and escutcheon. Limit maximum flow rate to 9.5 l/minute at 550 kPa.

.2 Shower supply valve:

.1 Pressure-balanced-actuated element, volume control, 45 degrees C maximum setting, strainer and check-stops on each inlet, lever handle.

.3 PSC-1: plastic shower cabinet.

.1 Cabinet: polypropylene.

.2 Sizes: as indicated.

.3 Base: moulded stone with chrome plated brass strainer and tailpiece.

.4 Accessories: soap dish, plastic curtain, and hooks.

.9 Fixture piping:

.1 Hot and cold water supplies to each fixture.

.1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.

.2 Waste:

.1 Brass P trap with cleanout on each fixture not having integral trap.

.2 Chrome plated in all exposed places.

## 3 EXECUTION

### 3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.2 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Physically handicapped: to comply with most stringent of either NBC or CAN/CSA B651.

## 3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

## 3.4 CLEANING

.1 Clean in accordance with Section 01 74 11- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Shop Drawings:

.1 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.3 In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

## 1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data

.1 Operation and maintenance manual approved by, and final copies deposited with Department Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Department Representative for approval. Submission of individual data will not be accepted unless directed by Department Representative.

.2 Make changes as required and re-submit as directed by Department Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Department Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right-hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Department Representative for approval and make corrections as directed.

.4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

## 1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease, and adapters to suit different types of grease and grease fittings.

**1.4 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes

.3 Replace defective or damaged materials with new.

**2 PRODUCTS**

**2.1 MATERIALS**

.1 HVAC and R Equipment:

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

.1 Visually inspect substrate in presence of Department Representative t.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

**3.2 PAINTING REPAIRS AND RESTORATION**

.1 Do painting in accordance with Section 09 91 23- Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

## 3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

## 3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00- Quality Control]and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting, and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

## 3.5 DEMONSTRATION

.1 Department Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment, and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Department Representative will record these demonstrations on video tape for future reference.

## 3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

## 3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

# 1 GENERAL

## 1.1 SUMMARY

.1 This Section includes requirements for selective demolition and removal of heating, ventilation and air conditioning systems, controls and automated automation components, and related mechanical components and incidentals required to complete the proposed work as shown on the drawings.

## 1.2 RELATED REQUIREMENTS

.1 Section 02 41 16– Structure Demolition

.2 Section 02 41 19.13– Selective Building Demolition

.3 Section 02 41 19.16– Selective Interior Demolition

.4 Section 02 42 00– Removal and Salvage of Construction Materials

## 1.3 REFERENCE STANDARDS

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Canadian Standards Association (CSA):

.1 CSA S350, Code of Practice for Safety in Demolition of Structures.

## 1.4 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling, and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following in accordance with Section 01 33 00– Submittal Procedures before starting work of this Section:

.1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19– Construction Waste Management and Disposal.

.2 Landfill and Recycling Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes. All certificates, receipts, and recycling attestations to be gathered in CWM plan binder.

## 1.6 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

## 1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with the following:

.1 Provincial/Territorial Workers' Compensation Boards/Commissions

.2 Government of Canada, Labour Program: Workplace Safety

## 1.8 SITE CONDITIONS

.1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed-on date that tender is accepted.

.2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Department Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:

.1 Refer to Section 01 41 00– Regulatory Requirements for directives associated with specific material types.

.2 Hazardous substances will be as defined in the Hazardous Products Act.

.3 Stop work in the area of the suspected hazardous substances.

.4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.

.5 Proceed only after written instructions have been received from Department Representative.

# 2 PRODUCTS

## 2.1 (SALVAGE AND) DEBRIS MATERIALS

.1 Material Ownership: Demolished materials become Contractor's property and will be removed from Project site.

.2 Salvaged Materials: Carefully remove materials designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 42 00.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Existing Conditions: Visit site, thoroughly examine, and become familiar with conditions that may affect the work of this Section before tendering the Bid; Department Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

### 3.2 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify Department Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that must remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Department Representative and users is minimized and as follows:

.1 Prevent debris from endangering the safe access to and egress from occupied buildings.

### 3.3 EXECUTION

.1 Demolition: Coordinate requirements of this Section with information contained in Division 02 and as follows:

.1 Disconnect and cap mechanical services in accordance with requirements of local Authority Having Jurisdiction.

.2 Do not disrupt active or energized utilities without approval of the Department Representative.

.3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.

.4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.

.5 At end of each day's work, leave worksite in safe condition.

.6 Perform demolition work in a neat and workmanlike manner:

.1 Remove any tools or equipment after completion of work and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

## 3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re-use in new construction in accordance with Section 02 42 00.

.2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with Local and National regulations.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 CSA Group (CSA)

.1 CSA B139-04, Installation Code for Oil Burning Equipment.

.3 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2015 (NFC).

.4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish, and limitations.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

# 2 PRODUCTS

## 2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181.

.1 Primer: maximum VOC limit 250 g/L to Standard GS-11.

.2 Paints: maximum VOC limit [150] g/L to Standard GS-11.

.2 Sealants: in accordance with Section 07 92 00- Joint Sealants.

.1 Sealants: maximum VOC limit to GSES GS-36.

.3 Sealants: maximum VOC limit to GSES GS-36.

.4 Adhesives: maximum VOC limit to GSES GS-36.

.5 Fire Stopping: in accordance with Section 07 84 00- Fire Stopping.

## 3 EXECUTION

### 3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

### 3.3 CLEARANCES

.1 Provide clearance around systems, equipment, and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada and CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

### 3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

### 3.5 AIR VENTS

.1 Install air vents in piping systems at high points, to CSA B139.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

### 3.6 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

## 3.7 PIPEWORK INSTALLATION

.1 Install pipework to CSA B139.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts, and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball valves at branch take-offs for isolating purposes except where specified.

.7 Install butterfly valves on chilled water and related condenser water systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Install ball valves for glycol service.

.10 Use chain operators on valves NPS 2 1/2 and larger were installed more than 2400 mm above floor in Mechanical Rooms.

.16 Check Valves:

.1 Install silent check valves in vertical pipes with downward flow, on discharge of pumps and as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

**3.8 SLEEVES**

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for firestopping.

.2 Maintain fire rating integrity.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

**3.9 ESCUTCHEONS**

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel-plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

**3.10 PREPARATION FOR FIRE STOPPING**

.1 Install firestopping within annular space between pipes, ducts, insulation, and adjacent fire separation in accordance with Section 07 84 00- Fire Stopping.

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

## 3.11 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 02- Cleaning and start-up of HVAC piping systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 00- Cleaning supplemented as specified in relevant mechanical sections.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

## 3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Department Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Department Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. Department Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Department Representative.

## 3.13 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Department Representative.

.2 Request written approval by Department Representative 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

## 3.14 CLEANING

.1 Clean in accordance with Section 01 74 00- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-07, Power Piping.

.2 ASTM International (ASTM)

.1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

.6 Underwriter's Laboratories of Canada (ULC)

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings for:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

.1 Department Representative will make available 1 copy of systems supplier's installation instructions.

## 1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00-Closeout Submittals.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

# 2 PRODUCTS

## 2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

## 2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

## 2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: painted with zinc-rich paint after manufacture.

.2 Use hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut carbon steel retaining clip.

.1 Rod: 13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed MSS-SP69, FM approved.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.

.4 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.5 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.6 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.7 Yoke style pipe roll: carbon steel yoke, rod, and nuts with cast iron roll, to MSS SP69.

.8 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass, or aluminum pipework: galvanized, with formed portion plastic coated.

.9 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

## 2.4 RISER CLAMPS

.1 Steel or cast-iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.

.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

## 2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m$^3$density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

## 2.6 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

## 2.7 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

## 2.8 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23- Structural Steel for Buildings. Submit calculations with shop drawings.

## 2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

## 2.10 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment.

.2 Provide 18 gauge sheet metal drip pan to support sumps and piping that is mounted below bottom level of floor decking.

.3 Concrete: Precast Concrete Blocks or concrete cinder blocks to Office of the Fire Marshall recommendations.

**2.11 OTHER EQUIPMENT SUPPORTS**

.1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23- Structural Steel for Buildings.

.2 Submit structural calculations with shop drawings.

**3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 INSTALLATION**

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13 mm or more,

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

**3.3 HANGER SPACING**

.1 Plumbing piping: to National Plumbing Code of Canada (NPC).

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6 Within 300 mm of each elbow.

| Maximum Pipe Size: NPS | Maximum Spacing Plastic | Maximum Spacing Copper |
|---|---|---|
| up to 1-1/4 | 1.2 m | 1.8 m |
| 1-1/2 | 1.5 m | 2.4 m |
| 2 | 1.5 m | 2.4 m |
| 2-1/2 | 1.5 m | 3.0 m |
| 3 | 1.5 m | 3.0 m |
| 3-1/2 | 1.5 m | 3.3 m |
| 4 | 2.4 m | 3.6 m |

.7 Pipework greater than NPS 12: to MSS SP69.

## 3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

## 3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

## 3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

## 3.7 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00- Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting, and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

## 3.8 CLEANING

.1 Clean in accordance with Section 01 74 00- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves, and controllers, including the installation and location of identification systems.

## 1.2 REFERENCE STANDARDS

.1 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1-05, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with Section 01 33 00- Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

## 1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

## 2 PRODUCTS

### 2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

### 2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned, and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

| Size # mm | Sizes (mm) | No. of Lines | Height of Letters (mm) |
|---|---|---|---|
| 1 | 10 x 50 | 1 | 3 |
| 2 | 13 x 75 | 1 | 5 |
| 3 | 13 x 75 | 2 | 3 |
| 4 | 20 x 100 | 1 | 8 |
| 5 | 20 x 100 | 2 | 5 |
| 6 | 20 x 200 | 1 | 8 |
| 7 | 25 x 125 | 1 | 12 |
| 8 | 25 x 125 | 2 | 8 |
| 9 | 35 x 200 | 1 | 20 |

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size #9.

.5 Identification for PSPC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

## 2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Department Representative.

## 2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Department Representative.

.2 Colours for legends, arrows: to following table:

| Background colour: | Legend, arrows: |
|---|---|
| Yellow | BLACK |
| Green | WHITE |
| Red | WHITE |

.3 Background colour marking and legends for piping systems:

| Contents | Background colour marking | Legend |
|---|---|---|
| ** Add design temperature | | |
| ++ Add design temperature and pressure | | |
| Treated water | Green | TREATED WATER |
| Hot water heating supply | Yellow / Red Stripe | HEATING SUPPLY |
| Hot water heating return | Yellow / Blue Stripe | HEATING RETURN |
| Make-up water | Yellow | MAKE-UP WTR |
| Boiler feed water | Yellow | BLR. FEED WTR |
| Intermittent blow-off | Yellow | INT. BLOW-OFF |
| Continuous blow-off | Yellow | CONT. BLOW-OFF |
| Domestic hot water supply | Green / Red Stripe | DOM. HW SUPPLY |
| Dom. HWS recirculation | Green / Orange Stripe | DOM. HW CIRC |
| Domestic cold water supply | Green / Blue Stripe | DOM. CWS |
| Waste water | Green | WASTE WATER |
| Sanitary | Green / Black Stripe | SAN |
| Plumbing vent | Green / Grey Stripe | SAN. VENT |
| Lubricating oil | Yellow | LUB. OIL |
| Hydraulic oil | Yellow | HYDRAULIC OIL |
| Gasoline | Yellow | GASOLINE |
| Fuel Oil | to Codes | |
| Propane | to Codes | |
| Gas regulator vents | to Codes | |
| Fire protection water | Red | FIRE PROT. WTR |
| Sprinklers | Red | SPRINKLERS |
| Carbon dioxide | Red | $CO^2$ |
| Instrument air | Green | INSTRUMENT AIR |

## 2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

## 2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

## 2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

## 2.8 LANGUAGE

.1 Identification in English and as required by local language requirements.

## 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### 3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 23- Interior Painting has been completed.

### 3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC/CSA registration plates as required by respective agency.

### 3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

### 3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping, or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

## 3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

## 3.7 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Division 01: Contractor's Verification, include:

.1 Materials and resources.
.2 Storage and collection of recyclables.
.3 Construction waste management.
.4 Resource reuse.
.5 Recycled content.
.6 Local/regional materials.
.7 Certified wood.
.8 Low-emitting materials.

## 3.8 CLEANING

.1 Proceed in accordance with Section 01 74 00- Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods, and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

.3 Due to the remote location, in situ reviews of the TAB process will need to occur to avoid multiple trips to the remote location. Daily reviews or Live video links may be necessary.

### 1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

### 1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.4 EXCEPTIONS**

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

**1.5 CO-ORDINATION**

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.6 START-UP**

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

**1.7 OPERATION OF SYSTEMS DURING TAB**

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

**1.8 START OF TAB**

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weatherstripping, sealing, and caulking.

.3 Pressure, leakage, other tests specified elsewhere Division 23.

.4 Provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal, and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed; volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

## 1.9 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

## 1.10 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

## 1.11 INSTRUMENTS

.1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

## 1.12 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

## 1.13 REVIEW MEETINGS DURING TAB

.1 Given the remote location, review meetings should be held at the start of each day to confirm the progress of commissioning and review results that deviate from the expected design conditions. The items reviewed in the meetings will be the following:

.1 Proposed schedules for daily activities

.2 Air flow of systems and grilles.

.3 Temperatures of equipment and processes.

.4 Settings of balancing devices and operating set points.

.5 Summaries of equipment to be further adjusted.

.6 Conditions that cannot be remedied or require additional support from another site trip.

**1.14 TAB REPORT**

.1 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.2 Submit 1 copy of TAB Report to Departmental Representative for verification and approval, in English in digital PDF format, complete with index tabs.

.3 Submit 6 copies of TAB Report to Departmental Representative for final approval and integration into O&M manual and verification and approval, in English in D-ring binders, complete with index tabs.

**1.15 VERIFICATION**

.1 Reported results subject to verification by Departmental Representative.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

**1.16 SETTINGS**

.1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

**1.17 COMPLETION OF TAB**

.1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

**1.18 AIR SYSTEMS**

.1 Standard: TAB to most stringent of this section TAB standards of SMACNA, ASHRAE or NBC.

.2 Do TAB of following systems, equipment, components, controls:

.1 Furnace

.2 HRV

.3 Domestic Hot Water Heater

.4 Fuel Oil System, Combustion Air, Venting System

.3 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.4 Locations of equipment measurements: to include as appropriate:

.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.

.2 At controllers, controlled device.

.5 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

**1.19 OTHER TAB REQUIREMENTS**

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.2 Building pressure conditions:

.1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.

.3 Zone pressure differences:

.1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combination of normal operating modes.

.4 Measurement of spatial vibration or noise from equipment specified in Division 23.

.1 TAB procedures:

.1 Test air noise (NC Levels) in all rooms for occupied modes of the heating system

.2 Measure vibration of the floor in occupied modes in the mechanical room and adjoining board room and office.

**1.20 POST-OCCUPANCY TAB**

.1 Participate in systems checks once during Warranty Period - #1 approximately 3 months, and during a prime heating seasonal time prior to the end of Warranty Period.

**PART 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**PART 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

# 1 GENERAL

## 1.1 SUMMARY

.1 Section Includes:

.1 Materials and methods for pressure testing ducts over 5 m in length, forming part of a supply, return or exhaust ductwork system directly or indirectly connected to air handling equipment.

## 1.2 REFERENCE STANDARDS

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

.1 SMACNA HVAC Air Duct Leakage Test Manual, 1985.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15- Sustainable Requirements: Construction.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties. Include pressure test information and results as follows:

.1 Submit proposed report form and test report format to Department Representative for approval at least three months before proposed date of first series of tests. Do not start tests until approval received in writing from Department Representative.

.2 Prepare report of results and submit to Department Representative within 24 hours of completion of tests. Include:

.1 Schematic of entire system.

.2 Schematic of section under test showing test site.

.3 Required and achieved static pressures.

.4 Orifice differential pressure at test sites.

.5 Permissible and actual leakage flow rate (L/s) for test sites.

.6 Witnessed certification of results.

.3 Include test reports in final TAB report.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's field reports specified.

## 1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section in accordance with Section 01 32 16.19- Construction Progress Schedules - Bar (GANTT) Chart.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

# 2 PRODUCTS

## 2.1 TEST INSTRUMENTS

.1 Test apparatus to include:

.1 Fan capable of producing required static pressure.

.2 Duct section with calibrated orifice plate mounted and accurately located pressure taps.

.3 Flow measuring instrument compatible with the orifice plate.

.4 Calibration curves for orifice plates used.

.5 Flexible duct for connecting to ductwork under test.

.6 Smoke bombs for visual inspections.

.2 Test apparatus: accurate to within +/- 3% of flow rate and pressure.

.3 Submit details of test instruments to be used to Department Representative at least three months before anticipated start date.

.4 Test instruments: calibrated and certificate of calibration deposited with Department Representative no more than 28 days before start of tests.

.5 Re-calibrated every six months thereafter.

# 3 EXECUTION

## 3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

## 3.2 TEST PROCEDURES

.1 Maximum lengths of ducts to be tested consistent with capacity of test equipment.

.2 Section of duct to be tested to include:

.1 Fittings, branch ducts, tap-ins.

.3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.

.4 Base partial system leakage calculations on SMACNA HVAC Air Duct Leakage Test Manual.

.5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.

## 3.3 SITE TOLERANCES

.1 System leakage tolerances specified are stated as percentage of total flow rate handled by system. Pro-rate specified system leakage tolerances. Leakage for sections of duct systems: not to exceed total allowable leakage.

.2 Leakage tests on following systems not to exceed specified leakage rates.

.1 Small duct systems up to 250 Pa: leakage 2 %.

.2 Large low pressure duct systems up to 500 Pa: leakage 2%.

.3 Evaluation of test results to use surface area of duct and pressure in duct as basic parameters.

## 3.4 TESTING

.1 Test ducts before installation of insulation or other forms of concealment.

.2 Test after seals have cured.

.3 Test when ambient temperature will not affect effectiveness of seals, and gaskets.

## 3.5 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services.

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, at stages listed:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of the Work, after cleaning is carried out.

.4 Obtain reports, within 3 days of review, and submit, immediately, to Department Representative.

.2 Performance Verification:

.1 Department Representative to witness tests and to verify reported results.

.2 To be certified by same TAB agency approved by Department Representative to undertake TAB on this project.

## 3.6 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-04, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International (ASTM)

.1 ASTM B209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.2 ASTM C335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-02e1, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.9 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

## 1.2 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - means "not concealed" as previously defined.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish, and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year, and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

.3 Samples:

.1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.

.2 Mount sample on 12 mm plywood board.

.3 Affix typewritten label beneath sample indicating service.

.4 Manufacturers' Instructions:

.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

## 1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.

# 2 PRODUCTS

## 2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

## 2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C553.

## 2.3 JACKETS

.1 Canvas:

.1 220 gm/$m^2$cotton, plain weave, treated with dilute fire-retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

.1 Maximum VOC limit 200 g/L GSES GS-36.

.3 Aluminum:

.1 To ASTM B209 without moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Smooth.

.4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

.1 Stainless steel:

.5 Type: 316.

.6 Thickness: 0.25 mm sheet.

.7 Finish: Smooth.

.8 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

## 2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.1 Maximum VOC limit 200 g/L GSES GS-36.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/$m^2$cotton, plain weave, treated with dilute fire-retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/$m^2$.

.6 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.

.7 Contact adhesive: quick setting

.1 Maximum VOC limit 200 g/L GSES GS-36.

.8 Canvas adhesive: washable.

.1 Maximum VOC limit 200 g/L GSES GS-36.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 12 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation with expanded metal lath on other face.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

## 3 EXECUTION

### 3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.2 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

### 3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with Section 23 05 29- Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

## 3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

| | TIAC Code | Vapour Retarder | Thickness (mm) |
|---|---|---|---|
| Rectangular cold and dual temperature supply air ducts | C-1 | yes | 100 |
| Round cold and dual temperature supply air ducts | C-2 | yes | 100 |
| Rectangular and round preheated cold air | C-2 | no | 50 |
| Round warm air ducts | C-1 | No | 25 |
| Supply, return and exhaust ducts exposed in space being served | none | | |
| Outside air ducts to mixing plenum | C-1 | Yes | 100 |
| Mixing plenums | C-1 | yes | 25 |
| Exhaust duct between dampers and louvres | C-1 | No | 100 |
| Rectangular ducts outside | C-1 | Special | 50 |
| Round ducts outside | C-1 | special | 50 |
| Acoustically lined ducts | none | | |

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

| TIAC Code | | |
|---|---|---|
| Rectangular | Round | |
| Indoor, concealed | none | none |
| Indoor, exposed within mechanical room | CRF/1 | CRD/2 |
| Indoor, exposed elsewhere | CRF/2 | CRD/3 |
| Outdoor, exposed to precipitation | CRF/3 | CRD/4 |
| Outdoor, elsewhere | CRF/4 | CRD/5 |

## 3.5 CLEANING

.1 Clean in accordance with Section 01 74 00- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 FURNACE SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform furnace verification after cleaning is completed and system is in full operation.

.2 When systems are operational, perform following tests:

.1 Conduct full scale tests at maximum design air flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.

.2 Verify performance of furnace system and connected HRV as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.

.1 HRV operation.

.2 Domestic Hot Water System.

.3 Maximum heating demand.

## 1.2 FURNACE SYSTEM CAPACITY TEST

.1 Perform hydronic system capacity tests after:

.1 TAB has been completed

.2 Verification of operating, limit, safety controls.

.3 Verification of domestic hot water heater.

.4 Verification of accuracy of temperature and pressure sensors and gauges.

.2 Calculate system capacity at test conditions.

.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

.5 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through HRV or opening doors, and monitor temperatures to ensure piping is not subjected to freezing conditions or

.2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 With furnace on full firing and HRV at full speed, record initial temperatures, return temperature mixed air temperature, supply air temperature and flue temperature.

.2 Conduct flue gas analysis test on furnace at full load and at low fire conditions.

## 1.3 FUEL OIL SYSTEMS

.1 Environmental protection systems:

.1 Test oil storage tank leakage detection system using manufacturer's recommended procedures.

.2 Test spill protection and over-fill protection systems using manufacturer's recommended procedures.

.2 Fuel oil pumps:

.1 Check strainers on pump inlet, relief valve on pump outlet with discharge to oil return piping, pressure gauge on strainer inlet, pump inlet and pump discharge.

.2 Verify pump performance.

.3 Pump performance within plus 20% and minus 0% of design.

.3 Operational Tests:

.1 Timing: perform at same time as 100% and 105% boiler PV tests.

.2 Charge system and verify operation.

.3 Verify adequacy of flow rates and pressure from storage facilities to burners.

.4 Verify accurate metering of fuel to burners.

.5 For further details refer to relevant sections of Division 23.

.4 Heavy oil systems:

.1 Verify temperature of stored oil and of oil adjacent to suction pipe.

.2 Verify steam pressure at storage tank inlet.

.3 Verify complete heat tracing system for completeness, controls, operation.

.4 Verify that steam condensate is discharged to sewer after being suitably cooled.

.5 Heavy oil pumping and heating set:

.1 For test purposes and where suction lift is involved, level of oil in tank should be near empty.

.2 Measure oil pressure at strainer inlet and outlet, inlet and discharge of pumps, inlet, and outlet of heaters.

.3 Measure oil temperature at inlet and outlet of heaters.

.4 Measure steam pressure at inlet of control valve and at inlet of heaters.

.5 Verify heat exchanger performance using procedures specified Section 23 57 00- Heat Exchangers for HVAC.

.5 Notify authorities having jurisdiction to enable witnessing of tests as required.

.6 Cathodic protection systems:

.1 Test oil storage tank and oil fill, vent, suction and return piping cathodic protection systems.

**1.4 POTABLE WATER SYSTEMS**

.1 When cleaning is completed, and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 23.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

**1.5 REPORTS**

.1 In accordance with Division 01 Reports, supplemented as specified herein.

**1.6 TRAINING**

.1 In accordance with Division 01 General Commissioning Requirements: Training of O&M Personnel, supplemented as specified herein.

**2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

# 1 GENERAL

## 1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

## 1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect electric and electronic control systems from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.1 THERMOSTAT PROGRAMMABLE

.1 Low voltage wall thermostat (Honeywell 8000 series or equivalent):

.1 For use on 24 V circuit at 1.5 A capacity.

.2 With heat anticipator adjustable 0.1 to 1.2 A.

.3 Temperature setting range: 10 degrees C to 25 degrees C.

.4 Programmable Modes to provide night set-back, and occupied setting for 7-day clock.

.5 Thermostat to have lock-out screen accessible by programmable code.

.6 Occupied setting to enable HRV and furnace fan on G contact,

## 2.2 RELAYS

.1 Low voltage relays:

.1 For use on 24 V circuit matched to furnace power supply.

.2 Contact rating for 10A at 250 V.

.3 With sub-base.

.2 Interposing relays:

.1 For use on 24 V circuit matched to furnace power supply.

.2 Contact rating for 30A at 250 V, motor rated.

.3 With sub-base.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electric and electronic control systems installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### 3.2 INSTALLATION

.1 Install control devices.

.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

.4 Furnace fan, HRV and control dampers to be operated from thermostat.

.5 Furnace to automatically enable furnace fan only in non-occupied heating mode and HRV when occupied.

.6 HRV internal defrost control to be set to extended defrost mode for colder climate.

.7 Provide time clock for occupied/unoccupied control with manual bypass switch marked “Day-Auto-Night”.

### 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

- .1 ASME-B16.3-2006, Malleable-Iron Threaded Fittings: Classes 150 and 300.
- .2 ASME-B16.9-2007, Factory-Made Wrought Steel Buttwelding Fittings.

.2 ASTM International (ASTM)

- .1 ASTM A47/A47M-99(2004), Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 ASTM B61-08, Standard Specification for Steam or Valve Bronze Castings.
- .4 ASTM B75M-99(2005), Standard Specification for Seamless Copper Tube Metric.

.3 Canadian Environmental Protection Act (CEPA)

- .1 CCME PN 1326-2008, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.

.4 CSA Group (CSA)

- .1 CSA-B139-09, Installation Code for Oil Burning Equipment.
- .2 CSA-B140.0-03, Oil Burning Equipment: General Requirements.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

.6 Manufacturers Standardization Society of the Valve and Fitting Industry (MSS)

- .1 MSS-SP-80-08, Bronze Gate, Globe, Angle and Check Valves.

.7 National Association of Corrosion Engineers (NACE)

- .1 NACE SP0169-2007, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

.8 National Research Council Canada (NRC)

- .1 National Fire Code of Canada 2015 (NFC).

.9 Underwriter's Laboratories of Canada (ULC)

- .1 CAN/ULC S603.1-03, External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids.
- .2 ULC ORD-C107.12-1992, Line Leak Detection Devices for Flammable Liquid Piping.

**1.2 ADMINISTRATIVE REQUIREMENTS**

.1 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section in accordance with Section 01 32 16.06- Construction Progress Schedule - Critical Path Method.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Test Reports:

.1 Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.3 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Manufacturers' Instructions: provide manufacturer's installation instructions.

**1.4 CLOSEOUT SUBMITTALS**

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

**1.5 QUALITY ASSURANCE**

.1 Ensure piping is installed by company authorized by authority having jurisdiction.

**1.6 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**2 PRODUCTS**

**2.1 DOUBLE WALL FUEL TANK**

.1 Certified to CAN 4-S602, with ULC, CSA or other approved agency marking.

.2 Materials as per CSA-B139, CEPA SOR/2008-197, NFC.

.3 Steel: to ASTM A53/A53M, Welded.

.4 Cladding and Coatings: Double wall steel section for corrosion protection, fully coated interior and exterior polyethylene coatings, full double wall containment system.

.5 Tank to have the following features:

.1 Drip leg with drain valve.

.2 Steel stand, of sufficient height to support tank at the correct elevations. Designed to support the weight of the tank and snow/wind loads.

.3 Support base coordinated with other divisions.

.4 Flex connectors to the pipe connections.

.5 Fill pipe with lockable hinged cap.

.6 Vent pipe with rain cap and vent extension to correct elevation,

.7 Vent whistle.

.8 Oil Level Gauge.

.9 Double wall inspection port and leak alarm.

## 2.2 FILL VENT AND CARRIER PIPE

.1 Materials as per CSA-B139, CEPA SOR/2008-197, NFC.

.2 Steel: to ASTM A53/A53M, Schedule 40, continuous weld or electric resistance welded, screwed.

.3 Copper: type L, soft copper tubing, to ASTM B75M, in lengths.

## 2.3 STEEL PIPE COATING

.1 Bituminous paint: in accordance with manufacturer's recommendations.

.2 Paints: in accordance with manufacturer's recommendations for surface conditions.

## 2.4 JOINTING MATERIAL

.1 Screwed fittings: pulverized lead paste.

.2 Brazed fittings: 85/15.

## 2.5 FITTINGS

.1 Steel:

.1 Malleable iron: screwed, banded, Class 150 to ASME-B16.3.

.2 Welding: butt-welding to ASME-B16.9.

.3 Unions: malleable iron, brass to iron, ground seat, screwed, to ASTM A47/A47M.

.4 Nipples: Schedule 40, to ASTM A53/A53M.

.2 Copper:

.1 Piping: brazed type.

.2 Connections to equipment: compression.

## 2.6 GATE VALVES

.1 NPS 2 and under, screwed bonnet: rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, solid wedge disc as specified under Section 23 05 23.01- Valves - Bronze.

**2.7 GLOBE VALVES**

.1 NPS 2 and under, screwed: to MSS-SP-80, Class 125, 860 kPa, bronze body, screwed over bonnet, renewable composition disc suitable for oil service.

.1 Lockshield handles: as indicated.

**2.8 BALL VALVES**

.1 NPS 2 and under: bronze body, screwed ends, TFE seal, hard chrome ball, 4 MPa, WOG as specified under Section 23 05 23.01- Valves - Bronze.

**2.9 SWING CHECK VALVES**

.1 NPS 2 and under, screwed: to MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc suitable for oil service, screw in cap, regrindable seat as specified under Section 23 05 23.01- Valves - Bronze.

**2.10 LUBRICATED PLUG COCKS**

.1 NPS 2 and under, screwed: to ASTM B61, Class 150, 1 MPa, bronze body.

**2.11 CATHODIC PROTECTION**

.1 Supply cathodic protection in accordance with Manufacturer’s Recommendations.

**3 EXECUTION**

**3.1 APPLICATION**

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 TANK**

.1 Install oil tank in accordance with local codes and ordinances as well as in accordance with CSA-B139, NBC, NFC, and CSA-B140.0.

.2 Elevations and base fabrication to be confirmed with equipment elevations.

.3 Vent location to be confirmed with fresh air intakes on the building.

**3.3 PIPING**

.1 Install oil piping system in accordance with CSA-B139, NFC, and CSA-B140.0.

.2 Slope piping down in direction of storage tank unless otherwise indicated.

.3 Underground piping to be protected in conformance with CAN/ULC-S603.1.

.4 Above ground piping to be protected from physical impact due to impact.

.5 Piping inside building:

.1 Ensure piping in solid flooring is installed to Office of the Fire Marshall, and CSA-B139.

.2 Use approved fitting to CSA-B139 for copper piping.

.3 Install filter, gate valve, and fire valve at burners.

.6 Fill, vent, suction and return piping outside building:

.1 Steel piping welded throughout except at tanks where electrically isolating fittings are used.

.2 Grading: slope piping at 1 % minimum back to tanks.

.7 Install buried piping in outer casings to CSA-B139 and the Office of the Fire Marshall.

.8 Piping at tanks:

.1 Suction: terminate 150 mm from bottom of tank with foot valve and strainer.

.2 Comply with authority having jurisdiction and CSA-B139 for piping for venting at tanks including venting whistle.

.3 Fill pipes: install to comply with CSA-B139.

.1 Include tight tamperproof cover.

.4 Dipstick: extend tube to within 150 mm from bottom of tank. Terminate at grade with lockable cap and chain, and watertight cover.

.9 Clearly label piping runs in legible form indicating:

.1 Piping product content.

.2 Direction of flow.

.3 Identify transfer points in piping systems to CPPI Colour-Symbol System to Mark Equipment and Vehicles for Product Identification

## 3.4 VALVES

.1 Install valves with stems upright or horizontal unless approved otherwise by Departmental Representative.

.2 Install ball valves at branch take-offs, to isolate pieces of equipment and as indicated.

.3 Install globe valves for balancing and in by-pass around control valves.

.4 Install plug cocks as indicated.

## 3.5 OVERFILL AND SPILL PROTECTION

.1 To CSA-B139.

## 3.6 LEAK DETECTION

.1 Install line leak detector to ULC ORD C107.12.

.2 Install secondary containment systems that will allow leaks to accumulate in containment sump available for visual inspection.

## 3.7 CATHODIC PROTECTION SYSTEM

.1 Cathodic protection to NACE SP0169.

.2 Use electric isolating type fittings and electric isolating components for tank manhole covers supplied with fuel oil storage tanks to isolate piping from tanks.

.3 Isolate buried piping into separate sections as indicated.

.4 Isolate buried piping systems from remainder of system inside building.

.5 Coat buried steel outer casing piping, before installation, with electrically resistant coating highly resistant to mechanical damage.

.1 Ensure 100% coverage.

.2 Repeat after installation at joints and damaged parts only.

.6 Inspect buried steel outer casing piping and repair damaged coatings using same materials as original coatings.

.7 Supply and install anode block for components inContact with soil.

## 3.8 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Test system to CSA-B139 and CSA-B140.0 and authorities having jurisdiction.

.2 Isolate tanks from piping pressure tests.

.2 Performance Verification:

.1 Refer to Division 01

## 3.9 CLEANING

.1 Clean in accordance with manufacturer's written recommendations, supplemented as follows:

.1 Flush after pressure test with number 2 fuel oil for a minimum of two hours. Clean strainers and filters.

.2 Dispose of fuel oil used for flushing out in accordance with requirements of authority having jurisdiction.

.3 Ensure vents from regulators, control valves are terminated in approved location and are protected against blockage and damage.

.4 Ensure entire installation is approved by authority having jurisdiction.

.5 All spills to remedied to address presence of hydrocarbons in soil and other surfaces. Local environmental regulation and authority to be consulted for certification of spill remediation.

.6 Clean in accordance with Section 01 74 00- Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.2 ASTM International (ASTM)

.1 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.

.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 National Fire Protection Association (NFPA)

.1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-11, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

.3 IAQ Guideline for Occupied Buildings Under Construction 2007.

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Albera, Canada.

.4 Test and Evaluation Reports:

.1 Certification of Ratings:

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect metal ducts from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.1 SEAL CLASSIFICATION

.1 Classification as follows:

| Maximum Pressure Pa | SMACNA Seal Class |
|---|---|
| 500 | C |
| 250 | C |
| 125 | C |
| 125 | Unsealed |

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

.3 Class C: transverse joints and connections made airtight with sealant. Longitudinal seams unsealed.

.4 Unsealed seams and joints.

## 2.2 SEALANT

.1 Sustainability Characteristics:

.1 Adhesives and sealants: in accordance with Section 07 92 00- Joint Sealants.

.2 Adhesives and sealants: VOC limit 250 g/L maximum to GS-36.

.2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

## 2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

## 2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

## 2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: short radius with single thickness turning vanes.

.2 Round: smooth radius, centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with 45 degrees entry on branch.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets:

.1 as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.

.1 Maximum included angles: as for transitions.

## 2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00- Fire Stopping.

.2 Fire stopping material and installation must not distort duct.

## 2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication, and reinforcement: to ASHRAE, SMACNA.

.3 Joints: to ASHRAE, SMACNA. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

## 2.8 STAINLESS STEEL

.1 To ASTM A480/A480M, Type 304.

.2 Finish: number 4.

.3 Thickness, fabrication, and reinforcement: to ASHRAE, SMACNA.

.4 Joints: to SMACNA, ASHRAE.

**2.9 ALUMINUM**

.1 To ASHRAE, SMACNA. Aluminum type: 3003-H-14.

.2 Thickness, fabrication, and reinforcement: to SMACNA, ASHRAE.

.3 Joints: to SMACNA, ASHRAE.

**2.10 BLACK STEEL**

.1 To ASTM A635/A635M.

.2 Thickness: 1.2 mm or as indicated.

.3 Fabrication: ducts and fittings to ASHRAE, SMACNA.

.4 Reinforcement: as indicated.

.5 Joints: continuous weld.

**2.11 KITCHEN EXHAUST SYSTEMS**

.1 Construct in accordance with NFPA 96.

.2 Material: 3003-H-14 aluminum sheet.

.3 Thickness: as indicated

.4 Fabrication: as indicated.

.5 Reinforcement: as indicated

.6 Drainage: as indicated

.7 Grease filters: to Section 23 38 13- Commercial Kitchen Hoods.

**2.12 HANGERS AND SUPPORTS**

.1 Hangers and Supports: in accordance with Section 23 05 29- Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to ASHRAE, SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE, SMACNA.

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: steel plate washer.

.3 For steel beams: manufactured beam clamps:

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal duct installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### 3.2 GENERAL

.1 Do work in accordance with ASHRAE, NFPA 90A, NFPA 90B, SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with ASHRAE, SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

### 3.3 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA, ASHRAE.

### 3.4 WATERTIGHT DUCT

.1 Provide watertight duct for:

.1 Dishwasher exhaust.

.2 Fresh air intake.

.3 Minimum 3000 mm from duct mounted humidifier in all directions.

.4 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.

.1 Solder joints of bottom and side sheets.

.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards fume hoods served.

.1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and trap primer and discharging as indicated.

## 3.5 KITCHEN EXHAUST SYSTEMS

.1 Install to NFPA 96.

## 3.6 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

## 3.7 LEAKAGE TESTS

.1 Refer to Section 23 05 94- Pressure Testing of Ducted Air Systems.

.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work.

## 3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

## 1.3 HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect air duct accessories from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

## 2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/$m^2$.

**2.3 ACCESS DOORS IN DUCTS**

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

.5 Hold open devices.

**2.4 TURNING VANES**

.1 Factory or shop fabricated single thickness with trailing edge, to recommendations of SMACNA and as indicated.

**2.5 INSTRUMENT TEST**

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

**2.6 SPIN-IN COLLARS**

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air duct accessories installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

## 3.2 INSTALLATION

.1 Flexible Connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:

.1 Size:

.1 As indicated.

.2 Locations:

.1 Fire and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Reheat coils.

.6 Elsewhere as indicated.

.3 Instrument Test Ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locations:

.1 For traverse readings:

.1 Ducted inlets to roof and wall exhausters.

.2 Inlets and outlets of other fan systems.

.3 Main and sub-main ducts.

.4 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations as approved by Department Representative.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

.4 Turning Vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

## 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish, and limitations.

## 1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dampers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.1 GENERAL

.1 Manufacture to SMACNA standards.

## 2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

**2.3 SINGLE BLADE DAMPERS**

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height as indicated.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

**2.4 MULTI-BLADED DAMPERS**

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: as indicated.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

**3.2 INSTALLATION**

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

.7 Corrections and adjustments conducted by Department Representative.

## 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S112-10, Standard Test Method of Fire Test of Fire Damper Assemblies.

.2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.

.3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish, and limitations.

## 1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for Fire dampers for incorporation into manual.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dampers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide:

.1 2 fusible links of each type.

## 2 PRODUCTS

### 2.1 FIRE DAMPERS

.1 Fire dampers: arrangement Type A, B, C, listed ULC, meet requirements of Fire Commissioner of Canada (FCC). Fire damper assemblies fire tested in accordance with CAN/ULC-S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.1 Fire dampers: 1 hour fire rated unless otherwise indicated.

.2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.

.3 Top hinged: offset, round or square; interlocking type sized to maintain full duct cross section as indicated.

.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.

.5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.

.7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.

.8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

.10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

### 2.2 SMOKE DAMPERS

.1 Smoke Dampers: to be ULC or UL listed and labelled.

.2 Normally closed reverse action smoke vent (S/D-RASV): folding blade type, from remote alarm signalling device actuated by an electro thermal link. Two flexible stainless steel blade edge seals to provide required constant sealing pressure.

.3 Normally open smoke/seal (S/D-SSSD): folding blade type, closing when actuated by means of electro thermal link from remote alarm signalling device. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts.

.4 Motorized (S/D-M): folding blade type, normally open with power on. When power is interrupted damper shall close automatically. Both damper and damper operator shall be ULC listed and labelled.

.5 Electro thermal link (S/D-ETL): dual responsive fusible link which melts when subjected to local heat of 94 degrees C and from external electrical impulse of low power and short duration; ULC or UL listed and labelled.

**2.3 COMBINATION FIRE AND SMOKE DAMPERS**

.1 Damper: similar to smoke dampers specified above.

.2 Combined actuator: electrical control system actuated from smoke sensor or smoke detection system and from fusible link.

**2.4 FIRE STOP FLAPS**

.1 Fire smoke flaps: ULC listed and labelled, and fire tested in accordance with CAN/ULC-S112.2.

.2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.

.3 Flaps held open with fusible link conforming to ULC-S505 and close at 74 degrees C or as indicated.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for fire and smoke damper installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 INSTALLATION**

.1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper. See Section 23 33 00- Air Duct Accessories.

.5 Co-ordinate with installer of fire stopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

**END OF SECTION**

# 1 GENERAL

## 1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

## 1.2 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.2 Include:

.1 Keys for volume control adjustment.

.2 Keys for air flow pattern adjustment.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# 2 PRODUCTS

## 2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**2.2 GENERAL**

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board and as specified.

.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: as directed by Department Representative.

**2.3 MANUFACTURED UNITS**

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

**2.4 SUPPLY GRILLES AND REGISTERS**

.1 General: with opposed blade dampers.

**2.5 RETURN AND EXHAUST GRILLES AND REGISTERS**

.1 General: with opposed blade dampers.

**2.6 DIFFUSERS**

.1 General: volume control dampers with flow straightening devices and blank-off quadrants and gaskets.

**2.7 RESIDENTIAL GRILLES, REGISTERS AND DIFFUSERS**

.1 Floor diffusers:

.1 Fixed blades: provide diverging air pattern along length of diffuser with dampers. Finish: as indicated.

.2 Housing and diffuser face to form rigid structure with duct connection collar and flanges.

**3 EXECUTION**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

**3.2 INSTALLATION**

.1 Install in accordance with manufacturers instructions.

.2 Install with stainless steel flat head screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers, and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

## 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 National Fire Protection Association (NFPA)

.1 NFPA 96-11, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.5 Society of Automotive Engineers (SAE)

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for louvers, intakes, vent, and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Indicate following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Test Reports: submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect louvers, intakes and vents from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

## 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

### 2.2 GOOSENECK HOODS

.1 Thickness: to ASHRAE, SMACNA.

.1 Kitchen: to NFPA 96.

.2 Elsewhere: to ASHRAE, SMACNA.

.2 Fabrication: to ASHRAE, SMACNA.

.1 Kitchen: to NFPA 96.

.2 Elsewhere: to SMACNA, ASHRAE.

.3 Joints: to SMACNA, ASHRAE. Proprietary manufactured flanged duct joint considered class A seal.

.4 Supports: as indicated.

.5 Complete with integral bird screen of 2.7 mm diameter aluminum wire. Use 19 mm mesh on intake, 12 mm mesh on exhaust.

.6 Horizontal backdraft dampers on 2 faces.

### 2.3 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 150 mm deep one-piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum bird screen on inside face of louvres in formed U-frame.

.8 Finish: factory applied enamel. Colour: to Departmental Representative's approval.

### 2.4 FIXED LOUVRES

.1 General: copper in welded steel frame, complete with anchors.

.2 Blades:

.1 24 ounce cold rolled copper set at 45 degrees, Z-shaped with drip lips.

.2 Stormproof design for outside air intakes.

.3 Maximum length without mullions of same material: 1250 mm.

.3 Frame: galvanized structural steel, welded construction. Paint welds after construction to Section 09 91 13- Exterior Painting.

.4 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum bird screen on inside face of louvres in formed U-frame.

.5 Finish: factory applied enamel. Colour: to Departmental Representative's approval.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for louvres, intakes and vents installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### 3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

### 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00- Cleaning.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.2 Underwriters' Laboratories of Canada (ULC)

.3 CSA Group (CSA)

.1 CSA-B139-09, Installation Code for Oil Burning Equipment.

.2 CSA-B140.0-03, Oil Burning Equipment: General Requirements.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for chimneys and stacks and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Indicate following:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

.8 Insulation and Thermal performance.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

## 1.3 CLOSEOUT SUBMITTALS

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

## 1.4 QUALITY ASSURANCE

.1 Ensure piping is installed by company authorized by authority having jurisdiction.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

## 2 PRODUCTS

### 2.1 BREECHINGS

.1 Factory fabricated 3.5 mm thick stainless steel with sweep bends from boiler outlet to thimble or chimney as indicated.

### 2.2 FUELS: PRESSURE CHIMNEY AND BREECHING

.1 ULC labelled, 760 degrees C rated.

.2 Sectional, prefabricated, double wall with mineral wool insulation with mated fittings and couplings.

.1 Liner: stainless steel. 304

.2 Shell: type 304 stainless steel

.3 Outer seals between sections: to suit application.

.4 Inner seals between sections: to suit application.

.3 Motorized dampers: as per equipment manufacturer’s guidelines with fitting to mate to supplied connectors.

.4 Hangers and supports: in accordance with recommendations SMACNA.

.5 Rain cap.

.6 Expansion sleeves with heat resistant caulking, held in place as indicated.

## 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for chimney and stack installation in accordance with manufacturer's written instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

### 3.2 INSTALLATION - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating wall and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install rain caps and cleanouts, as indicated.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).

.2 CSA Group (CSA)

.1 CSA B139, Installation Code for Oil Burning Equipment.

.2 CSA B140.2.1, Atomizing- Type Oil Burners.

.3 CSA B140.2.2, Pressure Atomizing Oil Burner Nozzles.

.4 CAN/CSA-B140.4, Oil-Fired Warm Air Furnaces.

.5 CSA C22.1-21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for heating boilers and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer.

.2 Indicate on drawings:

.1 General arrangement showing terminal points, instrumentation test connections.

.2 Clearances for operation, maintenance, servicing, tube cleaning, tube replacement.

.3 Foundations with loadings, anchor bolt arrangements.

.4 Piping hook-ups.

.5 Equipment electrical drawings.

.6 Burners and controls.

.7 All miscellaneous equipment.

.8 Flame safety control system.

.9 Breeching and stack configuration components and required accessories.

.10 Stack emission continuous monitoring system to measure CO, O, NOx, SO, stack temperature and smoke density of flue gases.

.3 Engineering data to include:

.1 Boiler efficiency at 25%, 50%, 75%, 100% of design capacity.

.2 Radiant heat loss at 100% design capacity.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

## 1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for heating boilers for incorporation into manual.

## 1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with applicable Provincial Territorial regulations.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra materials:

.1 Submit maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.1 Special tools for burners, access opening, handholes and Operation and Maintenance.

.2 Spare parts for 3 years of operation.

.3 Spare gaskets.

.4 Spare gauge glass inserts.

.5 Probes and sealants for electronic indication.

.6 Spare burner tips.

.7 Spare burner gun.

.8 Safety valve test gauge.

## 1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect boiler and equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# PART 2 PRODUCTS

## 2.1 GENERAL

.1 Provide CSA approved, packaged factory assembled unit consisting of cabinet, fan, induced fan, fan motor, intake/exhaust assembly, heat exchanger, combustion chamber, burner, controls, air filter, and condensate drain.

.2 Annual Fuel Utilization efficiency level range: 87%

.3 Certification of components and construction of factory assembled oil-fired unit: to CAN/CSA-B140.4.

**2.2 CAPACITY**

.1 Output: 31.3kW (107MBH) rating at sea level

.2 Air flow rate: 1450 cfm

.3 External static pressure: 1.0" W.C.

.4 Input:

.1 36.9kW (126MBH)

.2 0.90 USGPH Firing Rate

.5 Electrical characteristics: 120/1/60, FLA 15.7A, MCA 18.1A, MOCP 20A.

**2.3 TYPE**

.1 Up flow type with oil burner.

**2.4 CABINET**

.1 1.0 mm thick minimum steel with baked enamel finish.

.2 Welded steel base for floor type.

.3 Easily removed and secured access doors for components requiring service.

.4 Thermally insulated cabinet.

**2.5 HEAT EXCHANGER**

.1 Primary: heavy duty aluminized steel tube.

.2 Warranty: non-prorated 10 years.

**2.6 COMBUSTION CHAMBER**

.1 Power vent forced draft: to manufacturers standard.

.2 Sealed type: 100% outside air, to ANSI Z21.47/CSA 2.3.

**2.7 AIR FILTER(S)**

.1 Filter(s): 25 mm thick, glass fiber, disposable type. MERV 11

.2 Provide 12 spare filters.

**2.8 HEATER BURNER**

.1 General: to bear CSA and ULC labels.

.2 Oil burner:

.1 High pressure atomizing type, certified to CSA B140.2.1.

.2 Pressure atomizing oil burner nozzle, certified to CSA B140.2.2 and flame retention head.

.3 Two stage fuel pump.

**2.9 INTAKE AND VENT ASSEMBLY**

.1 Provide manufacturer's standard separate wall vent and intake complete with termination assembly for high artic installation.

.2 Sealed Vent kit and burner blanket kit.

**2.10 CONTROLS**

.1 General: conform to CSA C22.2 No.24.

.2 Oil firing;

.1 Operating controls: programable thermostat, fan operating control switch with continuous operating switch, solenoid oil delay valve, burner, draft control.

.2 Safety controls; flame safeguard-cadmium sulphide sensor, fan high limit control switch.

.3 Automatic flue-pipe damper: to CSA B140.14.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

.1 Install in accordance with manufacturer's instructions, regulations of authorities having jurisdiction and to Canadian Electric Code, CSA B139.

.2 Co-ordinate with Concrete Division regarding concrete base as indicated.

.3 Provide Departmental Representative written report of start-up test results.

.4 Bacharach smoke density number not to exceed #1.

**END OF SECTION**

# 1 GENERAL

## 1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 84, Method of Testing Air-to-Air Heat/Energy Exchangers (ANSI approved).

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for energy recovery equipment and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Test Reports:

.1 Catalogued or published ratings: obtained from tests carried out by manufacturer or those ordered from independent testing agency signifying adherence to codes and standards in force.

.2 Provide confirmation of testing.

.5 Manufacturers' Instructions: submit manufacturer's installation instructions.

.1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

## 1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.2 Extra Materials:

.1 Furnish list of individual manufacturer's recommended spare parts for equipment include:

.1 Bearings and seals.

.2 Washable filters

.3 Addresses of suppliers.

.2 List of specialized tools necessary for adjusting, repairing, or replacing.

# 2 PRODUCTS

## 2.1 GENERAL

.1 Comply with ASHRAE 84.

## 2.2 AIR TO AIR FIXED PLATE EXCHANGER

.1 Casing: anodized aluminum.

.2 Heat transfer surfaces: corrugated aluminum, edge sealed and bonded to casing.

.3 Cross contamination: not permitted.

.4 Condensate drain: NPS 2.

.5 Removable access panels.

.6 Accessories: automatic defrost.

.7 Performance characteristics: as indicated.

**2.3 DAMPERS - ACTUATED**

.1 Material: extruded aluminum (6063T5) damper frame is not less than 2.03mm in thickness.

.2 Blades: Extruded aluminum, internally insulated with expanded polyurethane foam and thermally broken.

.3 Blade seals are extruded EPDM. Frame seals are extruded silicone. Seals are secured in an integral slot within the aluminum extrusions.

.4 Linkage: installed in frame side and constructed of aluminum and corrosion resistant, zinc plated steel.

.5 Specified product: Tamco 9000 Series Dampers. Alternates will be accepted.

**2.4 2 POSITION ACTUATORS**

.1 Applicable Equipment: DM-1 and DM-2.

.2 Location: HRV-1 Outdoor air and exhaust air intakes.

.3 Manufacturer: Belimo

.4 Model: AFB24-S US

.5 Power Supply: 24 VAC

.6 Torque: 180 in-lb

.7 Control Signal: On/Off

.8 Running Time: 150 sec. constant

.9 Spring return fail close

.10 Supply multiple actuators where required to meet damper torque requirements

**3 EXECUTION**

**3.1 INSTALLATION**

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of adjacent ductwork with flexible connections.

.3 Install access doors in accordance with manufacturer’s recommendations.

**3.2 FIELD QUALITY CONTROL**

.1 Tests:

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Test and adjust air flow dampers and unit speed controls to suit specified air flow rate.

.3 Verify fail position of dampers with associated equipment.

**END OF SECTION**

# 1 General

## 1.1 GENERAL

1.1.1 This section covers items common to all Divisions 26 and is intended only to supplement the requirements of Division 1.

1.1.2 The plans and specifications are set out for convenience of grouping the work and are not intended to delineate the division of the work among various trades.

1.1.3 Provide all labour, co-ordination, supervision, tools, materials and equipment, as well as the application of a competent knowledge of construction whether or not directly specified or shown on the plans, required for the installation, testing and putting into operation each electrical system and product specified, except where it is specifically mentioned that certain materials and/or labour are not part of the contract.

1.1.4 Execute all work in a professional manner so as to present a neat and finished appearance when completed. Keep competent foremen and necessary journeymen and apprentices on the job during the progress of the work. Endeavor to maintain the same foreman for the duration of the work.

1.1.5 Become familiar with the construction drawings and when laying out the work arrange the equipment with due regard to architectural, structural, and mechanical features. Where locations of outlets and conduit runs are dependent upon equipment being installed by other trades or by the Owner, confirm the location of such outlet and conduit stub-up with no additional charge or expense, and make any necessary changes or additions to the routing of electrical raceways, etc., to accommodate the structural, mechanical and architectural conditions.

1.1.6 Where equipment supplied by the electrical trade must be built into the work of other trades, such as masonry, plastering, finishing, etc., the electrical trade shall supply the equipment to be built in, or measurements to allow the necessary opening to be left, by the trade concerned.

1.1.7 Before submission of tenders, each trade shall examine the plans and specifications of the other trades to ascertain requirements called for therein, and allow for these accordingly.

## 1.2 WORK INCLUDED

1.2.1 It is the intention of these specifications and drawings to provide for a complete and fully operating electrical system with facilities and services to meet the Parks Canada's requirements described herein, and in complete accord with applicable codes and ordinances.

1.2.2 In general, the work includes the supply and installation of the following:

1.2.2.1 Service, metering
1.2.2.2 Branch circuit panelboards, outlets and wiring.
1.2.2.3 Wiring for mechanical trades.
1.2.2.4 Lighting fixtures and lamps.
1.2.2.5 Emergency lighting system.
1.2.2.6 Exterior car receptacles and wiring.

1.2.2.7 Work done under cash allowances carried by Divisions 26 and others.

1.3 EXAMINATION OF DRAWINGS AND SITE

1.3.1 Before submitting tender, examine the site and allow for all existing conditions affecting the work under contract. Investigate and allow for costs of all services to be provided under this contract, and become satisfied that these can be supplied and installed without any additional charges after award of the contract.

1.3.2 Before submitting tender, examine the architectural and mechanical drawings and allow for running power to and connecting up all electrical apparatus shown thereon, including the supply and installation of any additional lighting shown thereon, whether or not these are called for on the electrical drawings or specifications.

1.4 DISCLAIMER

1.4.1 Notice is hereby given that the drawings and specifications have been prepared by Plan-Eng Consulting Inc. pursuant to its contract of professional retainer with its client. These drawings and specifications may contain limitations or errors which may not be evident. Their accuracy is not warranted.

1.4.2 Any person, other than our client, using or relying on these drawings or specifications may do so only upon condition that their rights to make any claim whatsoever, which may arise from the use of these drawings or specifications, are limited solely to the contractual rights which they may have against the person who provided the drawings and specifications to it pursuant to their contract. They further agree that they have no rights whatsoever to claim damages from Plan-Eng Consulting Inc resulting from the use of these drawings and specifications.

1.5 CHANGE ORDERS

1.5.1 Where the Contractor is requested to submit a price for a notice of proposed change to the work, he shall provide within fourteen (14) days of request, a detailed breakdown of his price, stating:

1.5.1.1 Quantity, unit amount and total amount of actual material or equipment cost or credit,
1.5.1.2 Number of hours of labour, hourly rate, and total actual labour cost or credit, and,
1.5.1.3 For changes involving an increase in the contract price, the approved overhead and profit margins listed in Division 0 under "Supplementary Conditions".

1.5.2 Refer to "Definitions" below.

1.6 CONTRACT BREAKDOWN

1.6.1 Within thirty days of the award of the contract, forward to the Departmental Representative a breakdown of the tendered electrical price into the divisions of work. This breakdown shall be in the form of a lump sum figure for each division, broken down into material costs and labour costs, with the aggregate of these division prices totaling to the tendered price.

1.7 DEFINITIONS

1.7.1 Refer to CSA C22.1 - 18 for "Definitions and General Requirements". These shall be applicable except as elsewhere defined in the specifications or on the drawings.

1.7.2 "Contractor" shall be defined, depending upon context, as the General Contractor, Subcontractor, or Sub-subcontractor that actually performs the work defined in the contract documents. Trade definitions shall be as per "General" paragraph above.

1.7.3 "Actual cost of materials" shall be deemed to be cost of material or equipment to the Contractor. All discounts, other than prompt payment discounts, shall be credited to the Owner.

1.7.4 "Actual cost of labour" shall be deemed to include both direct and indirect labour costs.

1.7.5 "Direct labour costs" shall be defined as the actual base wage rates payable to the Contractor and shall not exceed the base wage rates established by collective agreements.

1.7.6 "Indirect labour costs" shall be defined as the Contractor's actual related costs and payroll burden additional to direct labour costs, and shall not exceed the rates established by collective agreements. Indirect labour costs shall include, but not be limited to: vacation pay, Unemployment Insurance Commission contributions, Canada Pension Plan contributions, Worker's Compensation contributions, company pension costs, training funds, health and welfare costs, association dues, field supervision, small tools and equipment costs. Indirect costs shall not exceed 25% of direct labour costs.

1.7.7 "Overhead" shall be deemed to include all costs, dues and fees that are incurred in achieving the completion of the work or in support of the Contractor's overall program. Overhead shall include, but shall not be limited to, clean-up, hoisting, supervision, additional bonding, and photocopying.

1.7.8 "Inspection Authority" shall mean the agent of any authority having jurisdiction over construction standards associated with any part of electrical work on the site.

1.7.9 "Supply Authority" means the company or commission responsible for the delivery of electrical power to the project.

1.7.10 "Telecommunication Authority" means the company or commission responsible for the delivery of telephone or television services to the project.

1.7.11 "Electrical Code" or "C.E. Code" or "C.E.C." shall mean the current edition of the Canadian Electrical Code C22.1 - 18, Part I as adopted and modified by the Inspection Authority having jurisdiction.

1.7.12 Where the term "provide" refers to the Contractor, it shall mean to supply and install. Where the term "provide" refers to the Owner or his agent it means the Owner or his agent will deliver to the site for installation by the Contractor.

1.7.13 "Indicated" means as shown on contract drawings or noted in contract documents.

1.7.14 "Packaged Equipment" means prewired factory-packaged equipment, provided by others, which is in a completely electrically operable state after one final connection.

1.8 VOLTAGE RATINGS

1.8.1 Operating voltages: to CAN3-C235-83 (R2015).

1.8.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.9 MATERIALS AND EQUIPMENT

1.9.1 Equipment and material to be certified, manufactured and installed to applicable standards as set out by Canadian Standards Association (CSA) or other accredited agency. Underwriters Laboratories of Canada (ULC) standards shall also be met.

1.9.2 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Authority or CSA Special Inspection as required, and from the Departmental Representative.

1.9.3 Existing equipment which is to be reconnected shall bear CSA approval, or special approval as per Sentence 2 above.

1.9.4 Factory assembled control panels and component assemblies.

1.9.5 Where products or materials are specified by the technical description only without reference to manufacturer or trade name, these shall be supplied by a Canadian manufacturer who has been continuously engaged in business for at least five (5) years.

1.9.6 Where products or materials are specified by manufacturer or trade name, this is for the purpose of establishing a standard of quality of products and workmanship to which the Contractor shall adhere, and contractors quoting on products other than those specified or approved for substitution do at their own risk.

1.9.7 Where any products or materials are specified by both technical description and manufacturer's designation, the requirements of the technical description shall take precedence and the manufacturer's designation is given only as a standard of quality for fabrication and general design which shall be modified by the manufacturer to provide the particular features specified.

1.9.8 Any materials or products installed without prior approval shall, if so directed, be removed and replaced at the Contractor's expense with approved materials or products selected by the Parks Canada or their representative.

1.9.9 Acceptable manufacturers and products listed in this specification and on the contract, drawings does not imply exclusion of unlisted manufacturers and products, however application for approval to use same shall be submitted as per "Substitutions" paragraph below.

1.10 SUBSTITUTIONS

1.10.1 Substitution of material or equipment from the specified may only be made providing written approval is obtained before the close of tenders. Make application for substitutions in duplicate at least five (5) days before electrical tenders close, giving a complete technical description and illustrations of the equipment it is proposed to substitute and an itemization of the points of deviation from the specified equipment. Where alternate equipment requires installation or connection in addition to those required by the equipment specified, such costs shall be allowed for in the tender.

1.10.2 Within thirty (30) days of the award of the contract, ascertain the delivery dates of all equipment and apply for substitutions on those items which cannot be delivered in time for completion of the project on schedule. If such application for substitution has not been made, it will be assumed that delivery dates have been verified and delivery of materials or equipment will not delay completion of the project on schedule.

1.10.3 In the event materials specified do not bear appropriate approval or meet the Inspection Authority requirements, then this shall be made known in writing and application made for substitution of alternate material within thirty (30) days of the award of the contract. After this period, assume full responsibility for obtaining the approval of the local Inspection Authority and pay all charges levied, and make any modifications required.

1.11 CODES AND STANDARDS

1.11.1 Do complete installation in accordance with Canadian Electrical Code C22.1 – 21, 25th Edition 2021 except where specified otherwise.

1.11.2 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender submission.

1.11.3 Abbreviations for electrical terms: to CSA Z85-1983.

1.11.4 Comply with codes and standards referenced in individual Sections of the specifications.

1.11.5 National Building Code of Canada NBC 2015

1.11.6 Nunavut Good Building Practices Guidelines, 3rd Edition, 2020

1.12 PERMITS, FEES

1.12.1 Submit to following authorities necessary number of drawings and specifications for examination and approval prior to commencement of work:

1.12.1.1 Electrical Inspection Authority.
1.12.1.2 Building Inspection Authority.
1.12.1.3 Fire Prevention Authority.

1.12.2 Pay associated fees.

1.13 EQUIPMENT IDENTIFICATION

1.13.1 Nameplates: Lamacoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached unless specified otherwise. Sizes as follows:

1.13.1.1 Size 1: 12 mm high with 5 mm high letters.
1.13.1.2 Size 2: 20 mm high with 8 mm high letters.
1.13.1.3 Size 3: 25 mm high with 12 mm high letters.

1.13.2 Labels: Embossed plastic self adhesive labels (Dymo-Tape) is not allowable unless specified otherwise.

1.13.3 Coordinate names of equipment and systems with Division 15 to ensure that identical names are used.

1.13.4 Identify applicable equipment according to following schedule:

| Equipment | Nameplate Identification | | Size |
|---|---|---|---|
| Main distribution | - | Building name, consulting engineer, contractor, date, voltage, amperage | 3 |
| | - | Main breaker or disconnect | 2 |
| | - | Metering cabinet | 2 |
| | - | Instrument transformer enclosure including CT ratios | 2 |
| Distribution centres | - | Name, voltage, amperage | 2 |
| | - | Loads controlled | 1 |
| | - | Where fed from | 1 |
| Panelboards | - | Name | 2 |
| | - | Where fed from | 1 |
| Motor control centres | - | Name, voltage, amperage | 2 |
| | - | Where fed from | 1 |
| | - | Loads controlled | 1 |
| Disconnect switches | - | Load controlled and tag | 1 |
| | - | Where fed from | 1 |
| Starters, contactors | - | Load controlled and tag | 2 |
| | - | Where fed from | 1 |
| Emergency equipment | - | Name, capacity, voltage (red nameplate) | 2 |
| Line voltage cabinets | - | Name, voltage | 2 |

1.14 WIRING IDENTIFICATION

1.14.1 Identify 4 AWG wiring and smaller by continuous insulation colour.

1.14.2 Identify wiring larger than 4 AWG by continuous insulation colour or by colour banding tape applied at each end and at splices.

1.14.3 Identify individual circuits or zones by use of blank or pre-numbered wrap-on strips or heat-shrink sleeves at each termination or splice.

1.14.4 Maintain phase sequence and colour coding throughout each system.

1.14.5 Colour code:

1.14.5.1 120/240 V system:
1.14.5.1.1 Phase A - Red.
1.14.5.1.2 Phase B - Black.
1.14.5.2 Grounding conductors - Green.
1.14.5.3 Neutral conductors - White.

1.14.6 Use colour coded wires in communication cables, matched throughout system.

1.15 CONDUIT AND EQUIPMENT COLOUR CODING

1.15.1 Colour code all conduits in accordance with schedule below.

1.15.2 Code with plastic tape or paint at points where conduit enters wall, ceiling, or floor, and at 15 m intervals.

1.15.3 All pull boxes, junction boxes, covers, and conduit banding shall be finished in the following colours:

| | |
|---|---|
| 120/240V | Grey |
| Low Voltage Control for Lighting | Black |

NOTE: All cover markings are to be in black lettering.

1.15.4 All electrical equipment not included in article .3 above is to be color coded as follows:

| | |
|---|---|
| 120/240 V | Grey |
| Annunciator Cabinets | Red |

| | |
|---|---|
| Telephone Backboards | Grey |
| Computer and Data Systems Cabinets | Green |

All exterior of Motor Housings to match Voltage colour (Brush Only).

1.16 FINISHES

1.16.1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.

1.16.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

1.17 PROTECTION

1.17.1 Protect exposed live equipment during construction for personnel safety.

1.17.2 Provide warning signs, as specified and/or to meet requirements of Inspection Authority and Departmental Representative.

1.17.3 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

1.17.4 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.18 MANUFACTURERS' AND CSA LABELS

1.18.1 Visible and legible after equipment is installed.

1.19 FIRESTOPPING

1.19.1 Where cables or conduits pass through fire separations, fire seal with approved caulking compound in accordance with CSA standards and Alberta Building Code.

1.20 ACCESS DOORS

1.20.1 Supply access doors to concealed electrical equipment for operating, inspecting and servicing. Installation as specified in Division 9.

1.20.2 Access doors: flush mounted 14 gauge 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

1.20.2.1 General: prime coated steel.
1.20.2.2 Special areas such as tiled surfaces: stainless steel.

1.20.3 Provide ULC rated access doors in fire separations.

1.21 KEYS

1.21.1 For all electrical equipment specified to come with locks and keys such as fire-alarm cabinet, panelboards, low-voltage cabinets, and etc, contractor to master all keys so that one key opens all. Provide 10 sets of keys.

1.22 TRIAL USAGE

1.22.1 Temporary or trial usage by the Owner or his representative of any electrical apparatus, equipment, work or materials before final completion and written acceptance by the Owner shall not be construed as evidence of an acceptance by the Owner.

1.22.2 The Owner shall have the privilege of temporary usage as soon as the Contractor deems the work to be sufficiently advanced for such usage.

1.23 CARE, OPERATION AND START-UP

1.23.1 Instruct operating personnel in the operation, care and maintenance of equipment as specified in Section 16025.

1.23.2 Arrange and pay for services of the Departmental Representative to supervise start-up of installation, check, adjust, balance and calibrate components.

1.24 CLEANING

1.24.1 Do final cleaning in accordance with Division 1 requirements.

1.24.2 At time of final cleaning, lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt shall be cleaned using soft cloths and approved cleansers.

1.24.3 Vacuum out all panelboard, cabinet and enclosure tubs and clean all equipment surfaces so they are free of construction dirt and paint.

**END OF SECTION**

1.1 RELATED WORK

1.1.1 Submittals: Division 1.

1.2 RECORD DRAWINGS

1.2.1 Obtain an extra set of white prints and as the work progresses, clearly and accurately record on this set of prints, in red ink, all conduit runs, wire counts and equipment locations as actually installed. Submit record drawings to the Departmental Representative within thirty (30) days of the date of acceptance of the project.

1.2.2 Record drawings shall be kept current on a day to day basis and shall be kept in the Contractor's field office and shall be accessible to the Owner's representative at all times.

1.2.3 The Departmental Representative will provide reproducible (and electronic format) record drawings and submit to the Owner for their records.

1.3 SHOP DRAWINGS

1.3.1 Within thirty (30) days of the award of contract, prepare or obtain equipment shop drawings as required in individual sections of this specification. The drawings shall show construction and fabrication details, weights, outline dimensions, performance characteristics, ratings, schematic and connection diagrams of equipment being purchased. Review and verify all dimensions and ratings and where necessary, alter these shop drawings in order to have the equipment comply with the intent of the specifications and drawings. Where applicable, include wiring, single line and schematic diagrams. Wiring drawings showing interconnection with work of other divisions are required.

1.3.2 Include manufacturer's catalogue cuts and photometric data for lighting fixtures.

1.3.3 All shop drawings shall be delivered complete with a cover sheet indicating project name, date, contractor, name(s) of shop drawings enclosed, applicable specification section, number of pages attached, and space for review stamps and comments. A sample cover sheet is attached at the end of this section.

1.3.4 The review of shop drawings and technical data will be for general design only and will not relieve the contractor from responsibility for their accuracy. Inadvertent approval of shop drawings or technical data which are incomplete in detail or which contain original errors in technical data or sizes of equipment that does not fit the space available shall not be construed as approving departure from requirements of the drawings or specifications.

1.4 OPERATING AND MAINTENANCE MANUALS

1.4.1 Not less than thirty (30) days prior to acceptance of the project furnish, for review by the Departmental Representative, electrical system operating and maintenance manuals as further defined herein.

1.4.2 Each system and piece of equipment requiring adjustment or maintenance or whose operation is not readily apparent to unskilled users and each system requested by the Owner's representative shall be fully described in the manual. Identification numbers shall be used for each piece of equipment; these shall be identical to those used on the shop drawings and specifications.

1.4.3 Each section of the manuals to be complete with the following:

1.4.3.1 Name of system or equipment and manufacturer.
1.4.3.2 Name, address and phone number of nearest service and parts supplier.
1.4.3.3 Functional description of the system or equipment.
1.4.3.4 Operating instructions.
1.4.3.5 Maintenance instructions.
1.4.3.6 Trouble shooting guide.
1.4.3.7 Replacement parts list.
1.4.3.8 Illustrations - showing sizes, options, modifications.
1.4.3.9 Schematic and connection diagrams (these may be in a separate plan pocket or binder).
1.4.3.10 Assembly and parts drawings (these may be in a separate plan pocket or binder).

1.4.4 Provide three (3) electronic O&M Manuals PDF on Flash Drive as well as three (3) 215 x 280 mm extension type, three post catalogue binders bound with vinyl, orange in colour, hot stamped in gold lettering front and spine. Title as follows:

OPERATING AND MAINTENANCE MANUALS
FOR
(PROJECT NAME AND LOCATION)
ELECTRICAL SYSTEM
(PRIME DEPARTMENTAL
REPRESENTATIVE)
(ELECTRICAL
DEPARTMENTAL
REPRESENTATIVE)
(ELECTRICAL CONTRACTOR)
(DATE)

1.4.5 Index each binder according to the following indexing system:

1.4.5.1 Electrical Systems:
1.4.5.1.1 Provide table of contents page with clear plastic cover.
1.4.5.1.2 Certificates on the following:
- Contractor's warranty certificate.
- Inspection Authority inspection reports.
- Structured cabling certificate.

1.4.5.2 List of Electrical Drawings:
1.4.5.2.1 Index of electrical drawings.
1.4.5.2.2 Provide one copy of each as-built drawing under separate cover.

1.4.5.3 Description of Systems:
1.4.5.3.1 Provide complete description of each system.
1.4.5.3.2 Include detailed system description and components comprising that system, explanation of how each component operates, location of each device, and settings of components requiring adjustment.

1.4.5.4 Maintenance Materials and Spare Parts:
1.4.5.4.1 Provide an itemized list of all maintenance materials and spare parts turned over to Owner, complete with authorized signatures verifying receipt from the Contractor.
1.4.5.5 Systems Demonstration:
1.4.5.5.1 Provide a list indicating dates and attendees of all systems demonstrations given, including signatures.
1.4.5.6 Lighting:
1.4.5.6.1 Shop drawings.
1.4.5.6.2 Fixture type designation.
1.4.5.6.3 Name of manufacturer.
1.4.5.6.4 Catalogue number of fixture.
1.4.5.6.5 Catalogue number of lamps for replacement and where they may be obtained.
1.4.5.6.6 Catalogue number of replacement plastic diffusers or glassware.
1.4.5.6.7 Catalogue number of ballasts for fixtures having these.
1.4.5.6.8 Name, address and phone number of distributor and parts supplier.
1.4.5.6.9 A manufacturer's illustration of the fixture.
1.4.5.6.10 A list of the rooms where the fixture has been installed.
1.4.5.7 Wiring Devices:
1.4.5.7.1 Shop drawings.
1.4.5.10.2 Switches: manufacturer, types.
1.4.5.10.3 Receptacles: manufacturer, types.
1.4.5.10.4 Coverplates: manufacturer, types.
1.4.5.10.5 Specialty devices: manufacturer, description of operation and required maintenance.
1.4.5.8 Emergency Lighting System:
1.4.5.11.1 Shop drawings.
1.4.5.11.2 List of component parts.
1.4.5.11.3 Systems description, operation, required maintenance and manufacturer.
1.4.5.11.4 Results of tests conducted as per Section 26 01 35.
1.4.5.12 Communications Systems:
1.4.5.12.1 Shop drawings for each system.
1.4.5.12.2 List of component parts for each system.
1.4.5.12.3 Systems description, operation, required maintenance and manufacturer for each system.
1.4.5.12.4 Results of tests conducted as per Section 26 01 35.
1.4.5.13 Lighting Control Systems:
1.4.5.13.1 Shop drawings.
1.4.5.13.2 Systems description, operation, maintenance and manufacturer.
1.4.5.13.3 Results of tests conducted as per Section 26 01 35.

## 1.5 MAINTENANCE MATERIALS

1.5.1 Provide maintenance materials and spare parts as specified in individual Sections of the specifications.

1.5.2 Provide all special tools required for normal maintenance.

1.5.3 Provide a complete inventory of electrical spare parts, tools and maintenance materials as specified.

1.5.4 At completion of project, turn over maintenance materials to the Owner's representative and have them sign and date the inventory list. Provide a copy of the signed inventory list to the Departmental Represnetative.

1.6 BILL OF MATERIALS AND PRICING

1.6.1 Supply to Departmental Representative's office prior to closing of tenders a bill of materials and associated costs. These costs shall be based upon prices submitted to wholesalers or distributors, not including distributor's mark ups.

1.6.2 All manufacturers' agents and representatives, including those specified, shall comply with the above. The Departmental Representative reserves the right to substitute other manufacturer's products if the above conditions are not met.

1.7 ELECTRICAL PRODUCTS OPTION LIST

1.7.1 Identify equipment, systems and subtrades proposed to be used from among those approved for the project. Deliver the completed list to the Departmental Representative not later than twenty-four (24) hours after the close of electrical tenders. Failure to comply with these requirements shall mean the Contractor loses the option of choosing equipment, systems and subtrades and shall use those as may be directed by the Departmental Representative. This list shall give the name of the manufacturer (and subtrade **where applicable**) for each type of material, equipment or system proposed and be set out as follows:

| Division Of Work | | Manufacturer / Subtrade |
|---|---|---|
| .1 | Distribution Equipment | ---------- |
| .2 | Motor Controls | ---------- |
| .3 | Fire Alarm System | ---------- |
| .4 | Clock System | ---------- |
| .5 | Sound/Program/Media Retrieval System | ---------- |
| .6 | Security System | ---------- |

.7 Wiring Devices ----------

.8 Television System ----------

.9 Emergency Lighting ----------

.10 Exit Lighting ----------

.11 Low-Voltage Switching System ----------

.12 Structured Cabling System ----------

.13 Lamps (All Types) ----------

.14 Lighting Fixtures (Attach complete list indicating manufacturer catalogue number for each fixture type.)

Submitted by:_____

Date:_____20_____ Per: _____

1.8 SHOP DRAWING TRANSMITTAL

1.8.1 The following form is provided as a sample of an acceptable shop drawing transmittal.

PROJECT NAME:

DATE:

ELECTRICAL CONTRACTOR:

SHOP DRAWINGS ENCLOSED:

SPECIFICATION SECTION:

NUMBER OF PAGES:

REVIEW STAMPS AND/OR COMMENTS:

**END OF SECTION**

## 1 General

### 1.1 INTENT

1.1.1 Provide demonstration and instruction sessions to familiarize the Owner's operation and maintenance personnel with electrical systems and their operation and maintenance, prior to takeover by the Owner.

### 1.2 MANUFACTURER'S SITE SERVICES

1.2.1 Arrange and pay for appropriately qualified manufacturer's representatives to provide or assist electrical equipment and systems demonstration and instruction as specified herein.

### 1.3 CONTRACTOR / OWNER COORDINATION

1.3.1 Establish agendas and attendees for demonstration and instruction sessions in conjunction with Owner's representative. Coordinate scheduling of sessions with Owner's representative.

## 2 Products

### 2.1 MATERIALS

2.1.1 Provide copies of completed operation and maintenance manuals, prepared in accordance with Section 26 01 20, for use in demonstrations and instructions.

2.1.2 Provide all spare parts, tools and equipment in order to carry out demonstrations and instructions.

## 3 Execution

### 3.1 SYSTEMS DEMONSTRATIONS

3.1.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing and required maintenance for each of the following systems:

- 3.1.1.1 Emergency Lighting System:
  - 3.1.1.1.1 Testing and maintenance of batteries.
  - 3.1.1.1.2 Unit starting in Test position.
  - 3.1.1.1.3 Simulation of power failure and automatic unit start-up.
- 3.1.1.2 Emergency Shut-Off Sub-Panel
- 3.1.1.3 Mechanical Equipment Connections
- 3.1.1.4 Lighting Control Systems:
  - 3.1.1.4.1 Master control unit.
  - 3.1.1.4.2 Remote station operation.

3.1.1.4.3 Exterior lighting control.
3.1.1.4.4 Future Extension Locations:
3.1.1.4.5 Conduit stub-ups.

**END OF SECTION**

1.1 WORK INCLUDED

1.1.1 Test and check all portions of each electrical system for satisfactory operation. All tests to be done in the presence of the Departmental Representative or his delegate, suitably logged, tabulated, signed and incorporated into the Operating and Maintenance Manuals.

1.1.2 Perform tests using qualified personnel. Provide necessary material and instruments.

1.1.3 Testing and commissioning to be carried out under this contract at no extra cost to the Owner.

1.1.4 Procedures and tests outlined below are electrical tests required in addition to normal visual and mechanical inspections which must be carried out prior to placing equipment in service.

1.1.5 Provide records of all production tests required by EEMAC or CSA for all power distribution equipment to be provided.

1.1.6 Insert a copy of all test results into the operating and maintenance manuals. All test sheets submitted shall be typewritten.

1.1.7 Refer below and to other Sections for additional tests required.

1.2 MAIN SWITCHBOARD

1.2.1 Test reports are required on:

1.2.1.1 Calibration of all instruments and meters.
1.2.1.2 Overcurrent protective device co-ordination.
1.2.1.3 Load test.
1.2.1.4 Fault level verification.
1.2.1.5 Protective relaying calibration.

1.3 AUXILIARY SYSTEMS

1.3.1 Manufacturer's test reports are required for the following systems:

1.3.1.1 Communication cables between outlets and patch panel (printout).

1.4 LOAD BALANCE

1.4.1 Perform load tests when as many loads as possible are operable, prior to turnover to Owner.

1.4.2 Test load balance on all feeders at distribution centres, motor control centres and panelboards with all loads energized.

1.4.3 If load imbalance exceeds 15%, reconnect circuits to balance loads.

1.4.4 Measure and record full load ammeter readings of all panelboard, motor control centre and motor feeders.

1.4.5 Complete a motor survey sheet for each motor and insert into maintenance manuals. Indicate all nameplate data plus current draw at full load and overload selected.

1.5 GROUND RESISTANCE – Not Required

1.6 VOLTAGE TESTING AND ADJUSTING

1.6.1 Measure and record voltage at main service and all panelboards.

1.7 WIRING DEVICES

1.7.1 Test all wiring devices for correct operation, polarity and circuitry.

1.7.2 Check that bonding conductor connects both outlet box bonding screw and receptacle ground terminal.

1.8 COMMUNICATION CABLES

1.8.1 Test all communication cables between Ethernet outlets and Patch Panel

1.8.2 Submit Cable Test Printout

1.8.3 Check that bonding of the communication equipment to system ground.

**END OF SECTION**

1.1 SITE REVIEW BY DEPARTMENTAL REPRESENTATIVE

1.1.1 Progressive site review reports on the project will be prepared by the Departmental Representative or his delegate.

1.1.2 These site reviews shall not imply acceptance of the work completed to that time. Unsatisfactory work or materials may be rejected at any time regardless of previous reviews. The Departmental Representative reserves the right to note additional deficiencies as they become apparent.

1.1.3 The Contractor shall arrange for the electrical foreman to accompany the Departmental Representative or his delegate and remove panel or outlet box covers, fixture diffusers, or provide other services as requested to facilitate review of the installation.

1.1.4 The Contractor is to ensure that each item is completed by the next scheduled site review, whenever possible.

1.1.5 Provide a minimum of three (3) working days' notice for any requested site visit not regularly scheduled.

1.2 SUBSTANTIAL COMPLETION

1.2.1 Contractor is to check and verify in writing that the following items are complete prior to requesting a site review to obtain substantial completion of the project:

1.2.1.1 Record drawings are up to date.
1.2.1.2 Addenda, progress site review reports, requested changes and previously listed deficiencies have been completed.
1.2.1.3 Maintenance manuals have been submitted.
1.2.1.4 All equipment and devices are installed and operating as indicated.
1.2.1.5 All testing as called for under Section 26 01 35 is complete and reports issued.
1.2.1.6 Systems demonstration as called for under Section 26 01 30 has been carried out.
1.2.1.7 Maintenance materials as specified have been turned over to the Owner.

1.2.2 Any items not able to be completed in time shall be listed in writing and sent in with the request for site review above.

1.2.3 If the project is not complete and deficiencies are not identified prior to the site review, such review shall become null and void. The Contractor shall pay all costs for such trip which includes:

1.2.3.1 Traveling time.
1.2.3.2 Departmental Representative's time.
1.2.3.3 Sundry expenses.

1.3 FINAL COMPLETION

1.3.1 All deficiencies detailed on the substantial completion site review are to be completed and verified before a final review is carried out.

1.3.2 Further site reviews required due to non-completion of deficiencies shall be borne by the Contractor as per subsection 1.2.3 above.

**END OF SECTION**

## 1 General

### 1.1 REFERENCES

1.1.1 CSA C22.2 No. 0.3-92, Test Methods for Electrical Wires and Cables.

### 1.2 SHOP DRAWINGS

1.2.1 Submit shop drawings in accordance with Section 26 01 20.

## 2 Products

### 2.1 BUILDING WIRES

2.1.1 Conductors: stranded for 8 AWG and larger.

2.1.2 Conductors indoors: 98% conductivity copper, size as indicated, with insulation of chemically cross-linked thermosetting polyethylene material rated RW90, or nylon jacketed thermoplastic insulation type T90 Nylon, rated at 600 V.

2.1.3 Grounding conductors: 98% conductivity copper, size as indicated, with thermoplastic insulation type TW75, rated at 600 V.

### 2.2 ARMOURED CABLE

2.2.1 Conductors: insulated, copper, size as indicated.

2.2.2 Type: AC90.

2.2.3 Armour: interlocking type fabricated from steel strip.

### 2.3 CONTROL AND LOW VOLTAGE SIGNAL CABLES

2.3.1 Type LVT: 2 soft annealed copper conductors, shielded, minimum 24 AWG, with thermoplastic insulation, outer covering of thermoplastic jacket, and armour of closely wound aluminum wire.

2.3.2 Type ELC cable (bell wire) is not acceptable.

### 2.4 COMMUNICATIONS SYSTEMS CABLES

2.4.1 Communication system cables: to Section 27 10 00.

2.5 FLEXIBLE CORD

2.5.1 Flexible cord: 98% conductivity copper, 3 or 4 conductor and size as indicated, with 600 V insulation rated for extra-hard usage suitable for use in wet, damp and dry locations, rated SOW.

2.5.2 Flame retardant flexible cord: 98% conductivity copper, 3 or 4 conductor and size as indicated, with 600 V Exane insulation rated RW90, with flame retardant FT-4 rated neoprene jacket.

2.5.2.1 Acceptable material: Delta Suprenant Wire & Cable DAC1048C.

## 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

3.1.1 Install wiring as follows:

3.1.1.1 In conduit systems in accordance with Section 26 05 33.

3.1.2 All wiring shall be installed in conduit or raceways only. Exposed wiring is not allowed.

3.1.3 NMD90 cable shall not be used on this project.

3.1.4 Use CSA approved lubricants of type compatible with wire/cable jacket to reduce pulling tension.

3.2 INSTALLATION OF ARMOURED CABLES

3.2.1 Minimum wire size shall be No. 12 AWG.

3.2.2 Terminate cables in accordance with Canadian Electrical Code.

3.2.3 Armoured cable may only be used for:

3.2.3.1 Final connections to luminaires (recessed in T-bar) in lengths not exceeding 1.5 m.

3.2.3.2 Connection of wiring devices installed in millwork.

3.3 INSTALLATION OF CONTROL CABLES

3.3.1 Install cable in conduit.

3.3.2 Ground control cable shield.

3.4 INSTALLATION OF COMMUNICATION CABLES .

3.4.1 Installation of communication cables shall be in conduit.

**4**

4.1 WIRE SIZE SCHEDULE

4.1.1 Lighting and power circuits: No. 12 AWG minimum, except as follows:

4.1.1.1 No. 10 AWG for 15 A, 120 V home runs longer than 23 m.
4.1.1.2 No. 8 AWG for 15 A, 120 V home runs longer than 36 m.

4.1.2 Motor circuits: No. 12 AWG minimum, except as otherwise indicated on drawings or schedules.

4.1.3 Feeder circuits: as indicated on drawings or schedules.

4.1.4 Fire alarm system circuits: to Section 28 31 00.

4.1.5 Grounding conductors: as indicated on drawings or schedules, as required by C.E.C., and in accordance with Section 26

4.2 FIELD QUALITY CONTROL

4.2.1 Perform tests in accordance with Section 26 01 35

4.2.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

4.2.3 Check phase rotation and identify each phase conductor of each feeder.

4.2.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

4.2.5 Acceptance tests:

4.2.5.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
4.2.5.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

4.2.6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test and insert into operating and maintenance manuals.

4.2.7 Remove and replace entire length of cable if cable fails to meet any of the test criteria.

**END OF SECTION**

# 1 General

## 1.1 REFERENCES

1.1.1 CAN/CSA-C22.2 No. 0.4-04, Bonding of Electrical Equipment..
.

1.1.2 CAN/CSA-C22.2 No. 41, Grounding and Bonding Equipment.

## 1.2 RELATED REQUIREMENTS

1.2.1 Section 01 91 13 – Commissioning Requirements.

1.2.2 Section 26 05 00 – Common Work Results for Electrical.

1.2.3 Grounding conductors for all distribution grounding to be insulated copper, uninsulated where in contact with earth. Copper conductors shall be used in the following areas: grounding of transformer neutrals, service entrance switch ground of neutral, padmount transformer grounding, ground rider conductors from main ground station to sub-closets, telephone and data system grounds.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

1.3.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.3.2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3.3 Sustainable Design Submittals - Construction Waste Management: Submit project Waste Management Plan highlighting recycling and salvage requirements.

## 1.4 CLOSEOUT SUBMITTALS

1.4.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.4.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual..

## 1.5 DELIVERY, STORAGE AND HANDLING

1.5.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions..

1.5.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.5.3 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

1.5.4 Store and protect grounding equipment from nicks, scratches, and blemishes.

1.5.5 Replace defective or damaged materials with new.

**1.5.6** Develop Construction Waste Management Plan related to Work of this Section.

1.5.7 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

## 2 Products

### 2.1 EQUIPMENT

2.1.1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.

**2.1.2** Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated**.**

2.1.3 Rod electrodes: copper clad steel 19 mm diameter by minimum 3 m long.

2.1.4 Plate electrodes: copper, surface area 0.2 m2, minimum 1.6 mm thick.

2.1.5 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

2.1.6 Insulated grounding conductors: green, copper conductors, size as indicated..

2.1.7 Electrical Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

1.1.1 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to: Grounding and bonding bushings, Protective type clamps, Bolted type conductor connectors, Thermit welded type conductor connectors, Bonding jumpers, straps and Pressure wire connectors.

## 3 Execution

### 3.1 EXAMINATION

3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

3.1.2 Visually inspect substrate in presence of Owner’s Representative and Consultant.

3.1.3 Inform Owner’s Representative and Consultant of unacceptable conditions immediately upon discovery. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Owner’s Representative and Consultant.

### 3.2 INSTALLATION GENERAL

3.2.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

3.2.2 Install connectors in accordance with manufacturer's instructions..

3.2.3 Protect exposed grounding conductors from mechanical injury.

3.2.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

**3.2.5** Use mechanical connectors for grounding connections to equipment provided with lugs**.**

3.2.6 Soldered joints not permitted.

**3.2.7** Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit**.**

3.2.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

**3.2.9** Install separate ground conductor to outdoor lighting standards**.**

3.2.10 Install grounding resistance bank as indicated.

3.2.11 Connect building structural steel and metal siding to ground by welding copper to steel.

**3.2.12** Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections**.**

3.2.13 Bond single conductor, metallic armoured cables to cabinet at supply end and load end.

3.2.14 Ground secondary service pedestals**.**

3.3 ELECTRODES

**3.3.1** Make ground connections to continuously conductive underground water pipe on street side of water meter**.**

3.3.2 Install water metre shunt...

3.3.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

3.3.4 Install rod, plate electrodes and make grounding connections..

**3.3.5** Bond separate, multiple electrodes together..

3.3.6 Use size 2/0, 3/0 or 4/0 AWG copper conductors for connections to electrodes..

3.3.7 Install Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

**3.4.1** Install system and circuit grounding connections to neutral of primary 600 V system, secondary 208 V system

3.5 EQUIPMENT GROUNDING

**3.5.1** Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays

3.6 GROUNDING BUS

3.6.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

3.6.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.7 FIELD QUALITY CONTROL

3.7.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

3.7.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Owner’s Representative and Consultant and local authority having jurisdiction over installation.

3.7.3 Perform tests before energizing electrical system.

3.7.4 Disconnect ground fault indicator during tests.

3.8 CLEANING

3.8.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

3.8.2 Leave Work area clean at end of each day.

3.8.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

3.8.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

3.8.5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## 1 General

### 1.1 COORDINATION

1.1.1 Concrete work specified in Division 3.

1.1.2 Suspended ceiling work specified in Division 9.

1.1.3 Mechanical work specified in Division 15.

## 2 Products

### 2.1 SUPPORT CHANNELS

2.1.1 U shape, size 42 x 42 mm, 2.5 mm thick, suspended (trapeze style), set in poured concrete walls and ceilings as required.

## 3 Execution

### 3.1 INSTALLATION

3.1.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.

3.1.2 Secure equipment to poured concrete with expandable inserts.

3.1.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

3.1.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

3.1.5 Fasten exposed conduit or cables to building construction or support system using straps.

- 3.1.5.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- 3.1.5.2 Two-hole steel straps for conduits and cables larger than 50 mm.
- 3.1.5.3 Beam clamps to secure conduit to exposed steelwork.

3.1.6 Suspended support systems.

- 3.1.6.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- 3.1.6.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

3.1.7 For surface mounting of two or more parallel conduits use channels at 1.5 m oc spacing. Size conduit racks to provide 25% spare capacity.

3.1.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support equipment, conduit and cable runs.

3.1.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

3.1.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

3.1.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

3.1.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.1.13 Install surface mounted panelboards on painted G1S plywood backboards. Where practical, group panelboards on common backboard.

3.1.14 Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.1.15 Where wall is inadequate to support wall mounted equipment, mount equipment independently of wall or strengthen wall to suit.

3.1.16 All floor mounted equipment, such as distribution centres shall be mounted on a 100 mm high concrete housekeeping pad.

3.1.17 Combustible materials, such as wood blocking, are not permitted in ceiling spaces to support equipment.

**END OF SECTION**

# 1 General

## 1.1 REFERENCES

1.1.1 CAN/CSA C22.2 No.18-92, Outlet Boxes, Conduit Boxes, and Fittings.

1.1.2 CSA C22.2 No.45-M1981 (R2008), Rigid Metal Conduit.

1.1.3 CSA C22.2 No.56-1977 (R2003), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

1.1.4 CSA C22.2 No.83-M1985 (R2017), Electrical Metallic Tubing.

1.1.5 CSA C22.2 No.211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.

1.1.6 CAN/CSA C22.2 No.227.3-M91 (R2003), Flexible Nonmetallic Tubing.

## 1.2 LOCATION OF CONDUIT

1.2.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

# 2 Products

## 2.1 CONDUITS

2.1.1 Rigid galvanized steel threaded conduit: Schedule 40 thickness, size as indicated.

2.1.2 Electrical metallic tubing (EMT): with couplings, size as indicated.

2.1.3 Rigid PVC conduit: Schedule 40 thickness, FT-6 flame spread rated, size as indicated. Type DB2 PVC conduit.

2.1.4 Flexible metal conduit and liquid-tight flexible metal conduit: size as indicated.

2.1.5 Electrical non-metallic flexible tubing (ENT): size as indicated.

## 2.2 CONDUIT FASTENINGS

2.2.1 To Section 26 05 29

## 2.3 CONDUIT FITTINGS

2.3.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

2.3.2 Material: EMT fittings shall be steel material. Set-screw type fittings for EMT conduit are acceptable for interior work in dry areas only; use watertight connectors and couplings where indicated or required in exterior applications or areas exposed to moisture or dust.

2.3.3 Factory 'bends' where 45 or 90¤ bends are required for 78 mm and larger conduits.

2.4 FISH CORD

2.4.1 Polypropylene size as required.

## 3 Execution

3.1 CONDUIT INSTALLATION SCHEDULE

3.1.1 Install conduit according to following schedule:

| Conduit Type | Application |
|---|---|
| Galvanized rigid steel | - Service entrance elbows.<br>- Exposed stub-ups in concrete floors.<br>- Hazardous areas.<br>- Areas exposed to mechanical abuse. |
| Rigid PVC type DB2 | - Underground service entrances. |
| Rigid PVC unplasticized | - Exterior underground runs.<br>- Under concrete slabs.<br>- In cast-in-place concrete. |
| Flexible metal | -Connections to T-bar ceiling mounted equipment and devices. |
| Liquid-tight flexible | -Connections to vibration producing equipment, including:<br>- motor-driven equipment.<br>- Connections to equipment in damp locations.<br>- Connections to kitchen equipment. |
| ENT | - In cast-in-place concrete slabs. |
| Surface raceway | - Exposed work in public areas. |
| EMT | - All other applications. |

3.2 INSTALLATION GENERAL

3.2.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

3.2.2 Conceal conduits except in mechanical and electrical service rooms.

3.2.3 Seal conduits with approved duct sealing compound where conduit passes from heated to unheated areas. Penetration in wall or roof assembly must also be properly sealed to prevent condensation or air passage.

3.2.4 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

3.2.5 Provide factory made bends, or mechanically bend steel conduit over 35 mm trade size.

3.2.6 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

3.2.7 Install fish cord in all empty conduits.

3.2.8 Run two 27 mm spare conduits up to ceiling space from each flush panelboard. Terminate these conduits in 150 x 150 x 100 mm junction boxes in ceiling space, and label boxes appropriately.

3.2.9 Where conduits become blocked, remove and replace blocked section.

3.2.10 Cap all stubbed out conduits with tape or other approved material to prevent entry of construction material.

3.2.11 Dry and clean conduits out before installing wire.

3.3 SURFACE CONDUITS

3.3.1 Run parallel or perpendicular to building lines only.

3.3.2 Locate conduits behind heating equipment with 1.5 m clearance. Do not locate conduits less than 75 mm parallel to heating lines with a minimum of 25 mm at crossovers.- Not applicable

3.3.3 Run conduits in flanged portion of structural steel.

3.3.4 Group conduits wherever possible on channels.

3.3.5 Do not drill or cut through structural members without written permission.

3.3.6 Do not run ENT conduit exposed on surface. PVC conduit may be run on surface of walls, from floor penetration to panelboards.

3.3.7 Do not install non-metallic conduit in ceiling spaces or through fire separations.

3.4 CONCEALED CONDUITS

3.4.1 Do not install ENT conduit inside walls more than 1.5 m in length, above slab penetration.

3.4.2 Do not install conduits in concrete toppings.

3.4.3 Do not install non-metallic conduit in insulated cavities.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

3.5.1 Locate to suit reinforcing steel. Install in centre one third of slab.

3.5.2 Protect conduits from damage where they stub out of concrete.

3.5.3 Install schedule 40 steel sleeves where conduits pass through slab or wall. Plastic

sleeves may not be used in fire separations.

3.5.4 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.

3.5.5 Do not place conduits in slabs where slab thickness is less than 4 times conduit diameter.

3.5.6 Encase conduits completely in concrete, with minimum 25 mm cover.

3.5.7 Organize conduits is slab to minimize crossovers.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

3.6.1 Run conduits 27 mm and larger below slab. Ensure backfill material will not damage conduit, otherwise provide sand as backfill material.

3.6.2 Where surface mounted conduit penetrates a floor slab, install a 100 mm high concrete curb around the conduit.

3.7 CONDUITS UNDERGROUND

3.7.1 Slope conduits away from building to provide drainage.

**END OF SECTION**

## 1 General

### 1.1 REFERENCE STANDARD

1.1.1 CSA C22.2 No. 18-1981.

## 2 Products

### 2.1 OUTLET AND CONDUIT BOXES GENERAL

2.1.1 Size boxes in accordance with C.E.C.

2.1.2 102 mm square or larger outlet boxes as required for special devices.

2.1.3 Gang boxes where wiring devices are grouped.

2.1.4 Blank cover plates for boxes without wiring devices.

2.1.5 Combination boxes with barriers where outlets for more than one system are grouped.

### 2.2 SHEET STEEL OUTLET BOXES

2.2.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one, side with extension and plaster rings as required.

2.2.2 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.2.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished drywall and tile walls.

### 2.3 MASONRY BOXES

2.3.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

### 2.4 FLOOR BOXES

2.4.1 High capacity floor boxes, concrete-tight as required, with adjustable finishing plate to suit floor finish. Device mounting plates to accommodate number of duplex receptacles and structured cabling jacks as indicated.

2.4.1.1 Acceptable manufacturers: Canadian Electrical Raceways, H.H. Robertson.

### 2.5 CONDUIT BOXES

2.5.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of car heaters receptacles.

2.6 FITTINGS GENERAL

2.6.1 Bushing and connectors with nylon insulated throats.

2.6.2 Knock-out fillers to prevent entry of foreign materials.

2.6.3 Conduit outlet bodies for conduit up to 30 mm and pull boxes for larger conduits.

2.6.4 Double locknuts and insulated bushings on sheet metal boxes.

## 3 Execution

3.1 INSTALLATION

3.1.1 Support boxes independently of connecting conduits.

3.1.2 Fill boxes with paper, sponges, foam or similar approved material to prevent entry of construction material. Remove upon completion of work.

3.1.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

3.1.4 Provide correct size of openings in boxes for conduit. Reducing washers not allowed.

3.1.5 Exposed outlet boxes in public areas shall be surface raceway boxes only. Exposed sheet steel outlet boxes may be installed in service and unfinished areas only.

3.1.6 Install vapour hats on all boxes located on walls and ceilings where the building air/vapour barrier is penetrated.

3.1.7 Loose fill insulation shall not come in contact with outlet boxes.

3.1.8 Do not install outlets back-to-back in wall; allow minimum 300 mm horizontal clearance between boxes.

3.1.9 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m, and information is given before installation.

3.1.10 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.1.11 Because of drafting limitations, outlet locations shall be considered as being symbolic rather than the exact physical location for devices. Locate devices on the wall with prime regard for convenience of operation and the best usage of the wall space for this and other purposes. The latch side and swing of doors shall be determined from the architectural drawings and not from the electrical drawings.

3.1.12 Examine the drawings and the work of all other trades to establish the optimum location for electrical outlets and equipment for best utilization of the space.

3.1.13 The Contractor shall, prior to roughing-in any electrical outlets within each room, review the architectural elevations and fitment plans with the Departmental Representative and mark final locations and mounting heights on the field set of drawings, to be approved and signed. Failure to comply may result in outlets being moved at the Departmental Representative's discretion and at the Contractor's expense.

3.2 MOUNTING HEIGHTS

3.2.1 Mounting height of equipment is from finished floor or grade level to centreline of outlet unless specified or indicated otherwise.

3.2.2 If mounting height of equipment is not indicated verify before proceeding with installation.

3.2.3 Install outlet boxes at the following heights unless indicated otherwise:

- 3.2.3.1 Local switches: 1070 mm.
- 3.2.3.2 Receptacles:
  - 3.2.3.2.1 General: 350 mm
  - 3.2.3.2.2 Vehicle Maintenance and Workshop 450mm.
  - 3.2.3.2.3 Above top of continuous baseboard heater: 200 mm.
  - 3.2.3.2.4 Above top of counters or splash back: 175 mm.
  - 3.2.3.2.5 In mechanical and utility rooms: 1200 mm.
  - 3.2.3.2.6 For emergency battery packs: 2400 mm.
- 3.2.3.3 Telephone outlets: 350 mm.
- 3.2.3.4 Wall mounted telephone, 1070 mm.
- 3.2.3.5 Control stations: 1070 mm.
- 3.2.3.6 Thermostats 1220 mm.
- 3.2.3.7 Exit lights 2400 mm.
- 3.2.3.8 Emergency lights and battery packs 2400 mm, 3000 mm on high walls.
- 3.2.3.9 Wall mounted lighting fixtures:
  - 3.2.3.15.1 Interior: 2400 mm.
  - 3.2.3.15.2.Exterior: 1500 mm below top of exterior wall or as per architectural elevation and instruction

**END OF SECTION**

## 1 General

### 1.1 GENERAL REQUIREMENTS

1.1.1 Provide connection to all motors and special equipment as indicated on the drawings, specifications and schedules.

1.1.2 Examine the drawings and specifications of other trades and allow for connection of all equipment requiring electrical hook-up.

1.1.3 Confirm all electrical connections, loads and exact locations with supplier and installer prior to rough-in.

## 2 Products

### 2.1 MATERIAL

2.1.1 Provide all necessary materials and equipment to hook up equipment complete, in accordance with manufacturer's recommendations.

## 3 Execution

### 3.1 MECHANICAL EQUIPMENT

3.1.1 Install wiring, flexible connections, grounding, as indicated. Use liquid-tight flexible conduit connections to all motor-driven and vibration producing equipment.

3.1.2 Division 16 shall wire up all controls where controls switch power lines directly.

3.1.3 Check phase rotation before energizing.

3.1.4 Connect up all motorized dampers and backdraft dampers as indicated on mechanical drawings or specified in mechanical specifications.

3.1.5 Provide relays/contactors as required, operated by built-in motor thermal protection devices (thermistors), for motors incorporating this type of overload protection.

3.1.6 Provide disconnects for boiler modules (one disconnect per module), and wire up low water cutoffs.

3.1.7 Provide control power supply outlets as required by Division 15 for operation of control panels and similar equipment. Allow for a separate circuit for each control panel unless otherwise indicated.

3.1.8 Provide power to each sump pump control panel. From duplex controller, run two sets of conductors to each group of two sump pumps. Installation to meet requirements of C.E.C. Section 22 and Inspection Authority.

3.1.9 Provide 120 V connection to urinal solenoid controls.

3.1.10 Coordinate requirements for the foregoing with the mechanical trade.

**END OF SECTION**

## 1 General

1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20

1.2 MAINTENANCE MATERIALS

1.2.1 Provide maintenance materials in accordance with Section 26 0110.

## 2 Products

2.1 COMPONENTS

1.1.1 15 and 20 A, 120V, single pole, double pole, three-way, four-way quiet type switches as indicated.

2.2 MANUFACTURERS

2.2.1 Acceptable manufacturers: Thomas & Betts, Leviton

## 3 Execution

3.1 SWITCH INSTALLATION

3.1.1 Install low voltage switches complete with mounting brackets and plates.

3.1.2 Mount one, two or three switches in single gang box, four switches in two gang box, with box mounted horizontally. Provide flush mounted cabinet when housing more than four switches or as indicated. Mounting height to be in accordance with Section 26 05 34

3.2 PHOTOCONTROL INSTALLATION – Not applicable

3.2.1 Photocell shall be integrated in Exterior Lighting Fixtures

3.3 WIRING

3.3.1 Low voltage switch wiring to be minimum 18 AWG, type LVT, colour coded, installed in conduit. Band multiple groups of wiring together.

3.3.2 Line voltage wiring: to Section 26 05 13.

3.3.3 Leads for line and low voltage wiring to be 250 mm minimum.

3.3.4 Strap or clip wiring into position.

3.4 IDENTIFICATION

3.4.1 Switches shall be individually labelled indicating load controlled in multi-switch applications, using Size 1 nameplate.

3.4.2 Relays shall be labelled indicating circuit controlled.

**END OF SECTION**

## 1 General

### 1.1 RELATED WORK

1.1.1 Mounting: Section 26 05 29 - Fastenings and Supports.

### 1.2 SHOP DRAWINGS

1.2.1 Submit shop drawings in accordance with Section 26 01 20 - Submittals.

1.2.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

### 1.3 PLANT ASSEMBLY

1.3.1 Install circuit breakers in panelboards before shipment.

1.3.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

## 2 Products

### 2.1 PANELBOARDS

2.1.1 Panelboards: product of one manufacturer.

2.1.2 250 V panelboards: bus and breakers rated for 22 kA (symmetrical) interrupting capacity or as indicated.

2.1.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent identification as to circuit number and phase.

2.1.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

2.1.5 The mounting pan on which panel interior is mounted shall be of rigid construction, reinforced by flanging of the back pan with formed angle iron sides. Non-reinforced back pans of ordinary flat sheet steel are not acceptable.

2.1.6 Lockable door with keying mastered per Section 26 01 10

2.1.7 Copper bus with neutral of same ampere rating as mains.

2.1.8 Mains: suitable for bolt-on breakers.

2.1.9 Enclosure: CSA 1 with drip hoods.

2.1.10 Trim and door finish: as per colour schedule.

2.1.11 Trim with concealed front bolts and hinges.

2.1.12 Single tub design for panelboards of 72 circuits and less, double tub design for panelboards of 84 circuits.

2.2 BREAKERS

2.2.1 Breakers: to Section 26 28 20 - Moulded Case Circuit Breakers.

2.3 MANUFACTURERS

2.3.1 Acceptable manufacturers: Cutler-Hammer Canada, Schneider Canada, Siemens.

## 3 Execution

3.1 INSTALLATION

3.1.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

3.1.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

3.1.3 Mount at 1800 mm to top of panelboard from finished floor level, as required by Code, or as indicated.

3.1.4 Connect loads to circuits.

3.1.5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.1.6 Install filler pieces in unused circuit positions.

3.2 EQUIPMENT IDENTIFICATION

3.2.1 Provide equipment identification in accordance with Section 16010 - Electrical General Provisions.

3.2.2 Nameplate for each panelboard size 2 engraved with panel name, voltage and where fed from. Mount inside door for flush panelboards.

3.2.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

3.2.4 Nameplate on each panelboard indicating required interrupting capacity rating for replacement circuit breakers.

3.2.5 Complete circuit directory with typewritten legend showing location and load of each circuit.

**END OF SECTION**

## 1 General

### 1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20

## 2 Products

### 2.1 JUNCTION AND PULL BOXES

2.1.1 Welded steel construction with screw-on flat covers for surface mounting, CSA Enclosure type 1 / 3 as required.

2.1.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

### 2.2 CABINETS

2.2.1 Type D: sheet steel, formed construction with screw-on flat covers for surface mounting.

2.2.2 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting as required.

2.2.3 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S painted plywood backboard for flush mounting as required.

2.2.4 Switch and control cabinets: prime coated sheet stainless steel tub and door complete with concealed hinge, flush mounted cam lock, for flush mounting.

## 3 Execution

### 3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

3.1.1 Use Type D cabinets for pull boxes.

3.1.2 Install pull boxes in inconspicuous but accessible locations.

3.1.3 Mount cabinets with top not higher than 2 m above finished floor.

3.1.4 Install terminal block as indicated in Type T cabinets.

3.1.5 Only main junction and pull boxes are indicated. Install pull boxes in conduit runs exceeding 30 m or with more than three 90 degree bends.

3.1.6 Cabinets to be keyed alike, and provide one key per cabinet.

3.2 IDENTIFICATION

3.2.1 Provide equipment identification in accordance with Section 26 01 10

3.2.2 Install size 2 identification labels indicating system name or voltage and phase.

**END OF SECTION**

# 1 General

## 1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20.

1.1.2 Indicate type of multi-outlet assemblies with similar terminology to these documents.

# 2 Products

## 2.1 SURFACE RACEWAY FOR WIRING DEVICES

2.1.1 Two piece steel assembly manufactured for mounting wiring devices and associated wiring, with barriers to separate different systems.

2.1.2 Nominal cross-section dimensions:

2.1.2.1 Double compartment raceway: 110 mm high x 40 mm deep.

2.1.3 Finish: custom factory finish.

## 2.2 WIRING DEVICES

2.2.1 Receptacles: U-ground duplex receptacles, to Section 26 27 26 - Wiring Devices.

2.2.2 Low voltage outlets: RJ45 data jacks, to Section 27 10 00.

## 2.3 GROUNDING

2.3.1 Ground system through separate insulated grounding conductor.

## 2.4 FITTINGS

2.4.1 Elbows, tees, couplings, connectors and miscellaneous fittings manufactured as accessories to product line supplied to provide complete and finished installation.

## 2.5 MANUFACTURERS

2.5.1 Acceptable material:

2.5.1.1 Double compartment steel raceway: Canadian Electrical Raceways SR475B.

## 3 Execution

### 3.1 FITTINGS

3.1.1 Install supports, elbows, tees, connectors, and miscellaneous fittings.

3.1.2 Keep number of elbows, offsets and connections to minimum.

3.1.3 Install barriers where required.

### 3.2 WIRING DEVICES

3.2.1 Install wiring devices and associated wiring as indicated.

**END OF SECTION**

# 1 General

## 1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20

# 2 Products

## 2.1 SWITCHES

2.1.1 15 and 20 A, 120V, single pole, double pole, three-way, four-way quiet type switches as indicated.

2.1.2 Manually-operated general purpose ac switches as indicated and with following features:

2.1.2.1 Terminals approved for No. 10 AWG wire.
2.1.2.2 Silver alloy contacts.
2.1.2.3 Urea or phenolic moulding for parts subject to carbon tracking.
2.1.2.4 Suitable for back and side wiring.
2.1.2.5 Ivory toggle.

2.1.3 Toggle operated fully rated for LED, and up to 80% of rated capacity of motor loads.

2.1.4 Switches of one manufacturer throughout project.

2.1.5 Acceptable materials (120 V 15 A SPST): Arrow Hart No. 1891, Bryant No. 4801, Hubbell No. 1201, Leviton No. 53501, Pass & Seymour No. 15AC1.

## 3.2 OCCUPANCY AND MOTION SENSORS

3.2.1 Wall – mounted Occupancy Sensors – CSA Standard

3.2.2 Ceiling – suspended Motion Sensors – CSA Standard

## 3.3 RECEPTACLES

3.3.1 Duplex receptacles, CSA type 5-15R, 125 V, 15 A, U ground, with following features:

3.3.1.1 Ivory high impact housing.
3.3.1.2 Suitable for No. 10 AWG for back and side wiring.
3.3.1.3 Break-off links for use as split receptacles.
3.3.1.4 Minimum four back wired entrances, four side wiring screws.
3.3.1.5 Triple wipe heavy phosphor bronze contacts and rivetted or one piece grounding contacts.

3.3.2 Receptacles of one manufacturer throughout project.

3.3.3 Acceptable materials: Arrow Hart No. 5252, Bryant No. 5262, Hubbell No. 5252, Leviton No. 5096 or 5262, Pass & Seymour No. 5262-CAN.

3.3.4 Majority of receptacles will be wall-mounted.

3.4 SPECIAL WIRING DEVICES

3.4.1 GFCI receptacles: Class "A" ground fault circuit interrupting, 15 A, 125 V, 3 wire, with provision for test and reset, suitable for installation in flush mounted outlet box, 5 mA ground fault trip level.

3.5 COVER PLATES - GENERAL

3.5.1 Cover plates from one manufacturer throughout project.

3.5.2 Sheet galvanized steel utility box cover for wiring devices installed in surface-mounted utility boxes.

3.5.3 Stainless steel, chrome finish, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

3.5.4 Cast cover plates for wiring devices mounted in surface-mounted FS type conduit boxes.

3.5.5 Weatherproof single lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.- Not applicable.

3.6 COVER PLATES - COMBINATION OUTLETS

3.6.1 Wherever a wall mounted computer network cable outlet is shown on drawings, it shall be combined with a duplex receptacle in a two-gang barriered outlet box.

3.6.2 A 16 gauge zinc coated steel back plate shall provide solid support for communication devices.

## 4 Execution

4.2 INSTALLATION

4.2.1 Switches, as applicable:

4.2.1.1 Install single throw switches with handle in "UP" position when switch closed.
4.2.1.2 Install three-way switches with both handles in same position when circuit is off.
4.2.1.3 Install switches in gang type outlet box when more than one switch is required in one location.
4.2.1.4 Mount toggle switches at height specified in Section 26 05 34 or as indicated.
4.2.1.5 Install locking switches in all public areas.

4.2.2 Receptacles:

4.2.2.1 Install receptacles as follows:
4.2.2.1.1 Vertically mounted general purpose receptacles with

ground down.

4.2.2.1.2 Horizontally mounted general purpose receptacles with ground right.

4.2.2.2 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

4.2.2.3 Mount receptacles at height specified in Section 26 05 34 or as indicated.

4.2.2.4 Where split receptacle has one portion switched, mount vertically and switch upper portion.

4.2.3 Cover Plates:

4.2.3.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

4.2.3.2 Install suitable common cover plates where wiring devices are grouped.

4.2.3.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

4.2.3.4 Provide identification on all coverplates with circuit and panel number by a lamicoid label riveted onto the coverplate.

4.2.4 Replace any wiring devices broken or damaged during construction prior to takeover by Owner.

FIELD QUALITY CONTROL

4.2.5 Refer to Section 26 01 35 for required tests of wiring devices.

**END OF SECTION**

## 1. General

1. SHOP DRAWINGS

1.1 Submit shop drawings in accordance with Section 26 01 20 - Submittals.

## 2. Products

2.1 DISCONNECT SWITCHES

2.2.1 Non-fusible disconnect switches less than 30 A rating, to Section 26 27 26 - Wiring Devices.

2.2.2 Fusible and non-fusible disconnect switch in CSA Enclosure 1 for indoor use and 3 for outdoor use, or as required for application.

2.2.3 Provision for padlocking in on-off switch position by three locks.

2.2.4 Mechanically interlocked door to prevent opening when handle in ON position.

2.2.5 Quick-make, quick-break action.

2.2.6 On-off switch position indication on switch enclosure cover.

2.2.7 Provide full capacity solid neutral except for 3-wire motor disconnect switches.

2.2.8 As component part of combination starter: to Section 16811 - Motor Starters to 600 V.

2.2.9 Fuses: HRC type, size as indicated.

2.2.10 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

2.2 EQUIPMENT IDENTIFICATION

2.2.1 Provide equipment identification in accordance with Section 26 01 10 - Electrical General Provisions.

2.2.2 Indicate name of load controlled on size 2 nameplate.

3. MANUFACTURERS

1. Acceptable manufacturers: Cutler-Hammer Canada, Schneider Canada.

## 3. Execution

1. INSTALLATION

1. Install disconnect switches as indicated and as required by C.E.C.

1. Install correct size and type of fuse in fusible disconnects.

**END OF SECTION**

## 1 General

### 1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20.

1.1.2 Include time-current characteristic curves for breakers with ampacity of 100 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

## 2 Products

### 2.1 BREAKERS GENERAL

2.2.1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with interrupting capacity of 10 kA (rms symmetrical), and with temperature compensation for 40C ambient.

2.2.2 Common-trip breakers: with single handle for multi-pole applications.

2.2.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

2.2.4 Wafer or duplex type breakers will not be accepted.

2.2.5 Width of breakers shall be minimum 25 mm per pole.

### 2.3 CLASS "A" GROUND FAULT CIRCUIT INTERRUPTING BREAKERS

2.3.1 Moulded case thermal magnetic circuit breaker with ground fault circuit interrupter complete with zero sequence transformer, trip on 5 mA leakage current, and with provision for testing and reset.

## 3. Execution

3.1 INSTALLATION

3.1.1 Install circuit breakers in factory in quantities and types indicated.

**END OF SECTION**

## General

1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20.

1.1.2 Indicate:

1.1.2.1 Mounting method and dimensions.
1.1.2.2 Starter size and type.
1.1.2.3 Layout of identified internal and front panel components.
1.1.2.4 Enclosure types.
1.1.2.5 Wiring diagram for each type of starter.
1.1.2.6 Interconnection diagrams.

1.2 OPERATION AND MAINTENANCE DATA

1.2.1 Provide data for incorporation into maintenance manual specified in Section 26 01 20.

1.2.2 Include operation and maintenance data for each type and style of starter.

1.3 MAINTENANCE MATERIALS

1.3.1 Provide maintenance materials in accordance with Section 26 01 20.

1.3.2 Provide listed spare parts for each different size and type of starter:

1.3.2.1 1 control transformers.
1.3.2.2 1 operating coil.
1.3.2.3 2 control fuses.
1.3.2.4 1 indicating lamp.

## 2. Products

2.1 MATERIALS

2.1.1 Starters: to IEC 292 standards.

2.1.1.1 Interrupting capacity: 10 kA (rms symmetrical) or as indicated.

2.2 MANUAL MOTOR STARTERS

2.2.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

2.2.1.1 Switching mechanism, quick make and break.
2.2.1.2 One overload heater, manual reset, trip indicating handle.

2.2.2 Accessories
2.2.2.1 Key switch: standard duty labelled as indicated.
2.2.2.2 Indicating light: standard duty neon type.
2.2.2.3 Locking tab to permit padlocking in "ON" or "OFF" position.
2.2.2.4
2.2.3

## 2.3 FULL VOLTAGE MAGNETIC STARTERS

2.3.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
2.3.1.1 Contactor solenoid operated, rapid action type.
2.3.1.2 Motor overload protective device in each phase, manually reset from outside enclosure.
2.3.1.3 Power and control terminals.
2.3.1.4 Wiring and schematic diagram inside starter enclosure in visible location.
2.3.1.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

2.3.2 Combination type starters to include motor circuit interrupter with operating lever on outside of enclosure to control motor circuit interrupter, and provision for:
2.3.2.1 Locking in "OFF" position with up to 3 padlocks.
2.3.2.2 Locking in "ON" position.
2.3.2.3 Independent locking of enclosure door.
2.3.2.4 Provision for preventing switching to "ON" position while enclosure door open except for starters installed in motor control centres.

2.3.3 Accessories:
2.3.3.1 Selector switches: standard duty labelled as indicated.
2.3.3.2 Indicating lights: standard duty type and color as indicated.
2.3.3.3 2-N/O and 2-N/O spare auxiliary contacts unless otherwise indicated.

## 2.4 CONTROL TRANSFORMER

2.4.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with primary and secondary fuses for all ungrounded conductors, installed with the starter.
2.4.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 ENCLOSURE

2.5.1 Provide CSA Type 1 enclosure, or as required.
2.5.2 Apply finishes to enclosure in accordance with Section 26 01 10.

2.6 EQUIPMENT IDENTIFICATION

2.6.1 Provide equipment identification in accordance with Section 26 01 10.
2.6.2 Manual starter designation label, size 1, engraved as indicated.
2.6.3 Magnetic starter designation label, size 2 engraved as indicated.

2.7 MANUFACTURERS

2.7.1 Acceptable manufacturers: Allen-Bradley, Cutler-Hammer, Furnas, Klockner-Moeller, Schneider Square D Co., Westinghouse Canada.

## 3. Execution

3.1 INSTALLATION

3.1.1 Install starters, connect power and control as indicated.
3.1.2 Ensure correct fuses and overload devices installed, record sizes installed and insert data into maintenance manuals.
3.1.3 Provide one HOA selector switch and one red run indicating light with each starter unless otherwise indicated. Indicating light shall provide a true status of motor running condition.
3.1.4 All motors shall be wired for low voltage release using an HOA selector switch, unless automatic restarting of the motor would cause a hazard, in which case the motor shall be wired for low voltage protection using a start/stop selector pushbutton.

3.2 FIELD QUALITY CONTROL

3.2.1 Perform tests in accordance with Section 26 01 35 and manufacturer's instructions.

3.2.2 Take full load current readings of each motor and insert data into maintenance manuals.
3.2.3 Operate switches, contactors to verify correct functioning.
3.2.4 Perform starting and stopping sequences of contactors and relays.
3.2.5 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

**END OF SECTION**

## 1 General

1.1 REFERENCE STANDARDS

1.1.1 All lighting fixtures shall bear appropriate CSA factory or CSA Special Inspection approval, all costs of which must be borne by the manufacturer and included in their pricing.

1.2 PRICING SUBMISSION

1.2.1 Pricing submission shall be based on all fixtures being new.

1.3 SHOP DRAWINGS

1.3.1 Submit shop drawings in accordance with Section 26 01 20

1.4 MAINTENANCE MATERIALS

1.4.1 MAINTENANCE MATERIALS
Provide maintenance materials in accordance with Section 26 0110

1.5 FIXTURE SPECIFICATION –
1.5.1 Provide fixture manufacturer's specification including temperature ratings which for cold spaces shall be -40C.

## 2.0 Products – New Lighting Fixtures required – Page 2

2.1 LUMINAIRES

2.1.1 Energy efficient lighting programme of the project shall be followed, with the use of energy efficient Light Emitting Diode (LED) lamp, all fixtures,high power factor 90% or better, low harmonic distortion less than 20%,instant electronic drivers, light emitting diode exterior fixtures, occupancy sensors, day light saving sensor- mounted fixtures, photocell control, etc

2.1.2 Motion-sensor controlled lumnaires shall be provided in specified area.

2.1.3 The electrical contractor shall supply and install light fixtures as noted on the drawing complete with lamps, seismic – restraint hangers and miscellaneous equipment necessary for a complete and operational installation.

2.1.4 Where recessed fixtures are utilized in insulated ceilings, electrical contractor to confirm with general contractor that fixture will be boxed in with drywall as per code. No extras will be allowed for failure to do so.

2.1.5 Fixtures shall be recessed, or drywall surface-mount, or chain-suspended.

2.1.6 Exterior lighting shall be Cooper Lumark Crosstour 5A with integral photocell

2.1.7 Fixtures shall be left clean upon completion of the project and all lamps operational.

2.2 Provide in corridors, utility rooms, and paths of egress, self-contained emergency

lighting unit battery-packs shall conform to CSA C22.2 No. 141 and provide at full load minimum 30 minutes illumination.

2.3 Emergency Lighting Fixtures shall be rated -40Cin cold temperature areas.

## 3 Execution

### 3.1 INSTALLATION

3.1.1 Locate and install luminaires as indicated.

3.1.2 Install recessed fixtures to allow removal from below, to gain access to outlet or pre-wired junction box.

3.1.1 Coordinate entire installation with other trades on site to avoid conflicts. During installation, locate ductwork and any other items that may cause interference in the ceiling space with light fixtures. Notify Departmental Representative promptly of such conditions.

### 3.2 WIRING

3.2.1 Connect luminaires to lighting circuits:

3.2.1.1 Directly for exterior, and wall mounted luminaires, and for luminaires mounted directly to ceiling structure.
3.2.1.2 Through flexible cable for exposed flexible connections.
3.2.1.3 Through type AC cable for all other luminaires.

3.2.2 All wiring shall be minimum 90 deg.C rated.

### 3.3 LUMINAIRE SUPPORTS

3.3.1 Fixtures surface mounted on Drywall ceiling shall be supported by manufacturer's recommended material

3.3.2 Fixtures suspended from the roof soffit by means of chains shall be with material and accessories provided by the manufacturer.

3.3.3 Combustible materials, such as wood blocking, may not be used in ceiling spaces to support fixtures.

### 3.4 LUMINAIRE CLEANING

3.4.1 Thoroughly clean all fixtures, including reflectors, lamps, diffusers, louvers and lenses, in accordance with Section 26 01 10

3.4.2 Adjust lenses, frames and trims to eliminate light leaks.

**END OF SECTION**

## 1 General

### 1.1 REFERENCE STANDARDS

1.1.1 CSA C22.2 No. 141-M1985(R1999).

1.1.2 CSA Bulletin 1123A.

1.1.3 Canadian Electrical Code C22.1 - 18, Part I, Section 46.

### 1.2 SHOP DRAWINGS

1.2.1 Submit shop drawings in accordance with Section 26 01 20.

1.2.2 Data to indicate system components, mounting method, source of power and special attachments.

### 1.3 DELIVERY

1.3.1 Deliver batteries in dry state unless hermetically sealed.

1.3.2 Provide electrolyte in hazard-proof container.

### 1.4 GUARANTEE

1.4.1 Provide a written guarantee, stating that the battery for emergency lighting is guaranteed against defects in material and workmanship for a period of ten years, with a no-charge replacement during the first year and a pro-rata charge on the remainder, from the date of substantial completion.

## 2 Products

### 2.1 UNIT EQUIPMENT

2.1.1 Supply voltage: 120 V ac.

2.1.2 Output voltage: 12 V dc.

2.1.3 Operating time: 60 min at full load.

2.1.4 Capacity: full connected load as indicated on drawings, plus minimum 20% spare capacity.

2.1.5 Auto-Test Feature

2.1.6 Battery: hermetically sealed lead acid, maintenance free, 10 year life.

2.1.7 Charger: solid state, three stage multi-rate with power boost, voltage/current regulated, inverse temperature compensated, short circuit protected, modular construction.

2.1.8 Solid state transfer, operates on either brownout or blackout conditions.

2.1.9 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

2.1.10 Signal lights: solid state, life expectancy 100,000 h minimum, for 'AC Power ON' and 'High Charge'.

2.1.11 Cabinet: suitable for direct or shelf mounting to wall, with knockouts for conduit, finished in white.

2.1.12 Standard equipment to include:

2.1.12.1 Auto-Test switch.
2.1.12.2 Battery disconnect cord.
2.1.12.3 dc output terminal blocks inside cabinet.
2.1.12.4 Cord and plug connection for ac.

2.1.13 Additional equipment to include:

2.1.13.1 Ammeter.
2.1.13.2 Voltmeter.
2.1.13.3 Time delay relay, 10 minute delay.
2.1.13.4 Mounting bracket.
2.1.13.5 RFI suppressors.
2.1.13.6 Remote test system, capable of activating emergency lights by use of a remotely operated hand-held controller.
2.1.13.7 Multi-circuit fused distribution panel.

2.1.14 Acceptable material: Lumacell RGS series, AimLite Deluge Emergi-Lite, Ready-Lite LDX12 series, Lithonia.

2.2 LIGHTING HEADS

2.2.1 Swivel type head.

2.2.2 Integral on unit and remote mounted as indicated.

2.2.3 Finish: white.

2.2.4 Lamp type: 6 W Max. LED.

2.2.5 Acceptable material:

2.2.5.1 6 W LED Max.: Lumacell RGS series, AimLite Deluge Emergi-Lite, Ready-Lite LDX12 series, Lithonia

2.3 WIRING OF REMOTE HEADS AND EXIT LIGHTS

2.3.1 Conduit: type EMT, to Section 26 05 33.

2.3.2 Conductors: RW90 type to Section 26 05 13, sized as indicated in accordance with manufacturer's recommendations to maintain current flow with maximum 5% voltage drop.

## 3 Execution

3.1 INSTALLATION

3.1.1 Install unit equipment for emergency lighting in accordance with reference standards listed in 1.1 above.

3.1.2 Install unit equipment and remote mounted fixtures as indicated.

3.1.3 Cut and re-cap cord to remove surplus. Plug into receptacle connected to circuit feeding no other loads.

3.1.4 Direct heads as indicated.

**END OF SECTION**

## 1 General

### 1.1 SHOP DRAWINGS

1.1.1 Submit shop drawings in accordance with Section 26 01 20.

## 2 Products

### 2.1 FABRICATION

2.1.1 Housing: extruded aluminum frame, white finish, thin profile.

2.1.2 Lamps: high intensity, non-protruding LEDs, less than 2 W power consumption.

2.1.3 Designed for 25 years of continuous operation without replacement.

2.1.4 Power supplies:

2.1.4.1 Normal power: 120 Vac.
2.1.4.2 Emergency power: 12 Vdc, refer to Section 26 52 01.

2.1.5 Pictogram Greenman Running: evenly illuminated fibreglass on die-cast face plate Pictogram Greenman Running

2.1.6 Exit Sign Fixtures shall be self-powered for 30-minutes

### 2.2 DESIGN

2.2.1 Wall mounting.

2.2.2 Single or double face as indicated.

2.2.3 Directional arrows: as indicated. Knock-out style arrows aracceptable.

### 2.3 MANUFACTURERS

2.3.1 Acceptable manufacturers: Dual-Lite Excalibur series, Lumacell LER-400 series, Lithonia.

## 3 Execution

3.1 INSTALLATION

3.1.1 Install exit lights wall mounted and ceiling mounted only when not practical or possible to wall mount.

3.1.2 Connect fixtures to exit light circuits as indicated. Exit light circuits shall be used for no other loads.

3.1.3 Ensure that exit light circuit breaker is locked in on position.

**END OF SECTION**

# 1. General

## 1.1 REFERENCES

1.1.1 CSA T527-94 (ANSI/EIA/TIA 607), Grounding and Bonding for Telecommunications in Commercial Buildings
1.1.2 CAN/CSA T528-93(R1997) (ANSI/EIA/TIA 606), Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings
1.1.3 CSA T529-95 (ANSI/EIA/TIA 568B), Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings
1.1.4 CAN/CSA T530-M90(R1997) (ANSI/EIA/TIA 569), Building Facilities Design Guidelines for Telecommunications
1.1.5 CSA C22.1, Canadian Electrical Code, Part I
1.1.6 CAN/CSA C22.2 No.182.4-M90(R1996), Plugs, Receptacles, and Connectors for Communication Systems
1.1.7 CSA C22.2 No.214-94, Communication Cables
1.1.8 ANSI/EIA/TIA TSB 67, Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems
1.1.9 ANSI/EIA/TIA TSB 72, Centralized Optical Fiber Cabling Guidelines
1.1.10 ANSI/EIA/TIA TSB 75, Additional Horizontal Cabling Practices for Open Offices
1.1.11 Building Industry Consulting International (BICSI) TDM Manual

## 1.2 CONTRACTOR QUALIFICATIONS

1.2.1 All structured cabling work shall be performed by a Telecommunications Contractor whose normal business is the installation of voice, data, and image cabling systems, and to perform associated testing.
1.2.2 The Telecommunications Contractor shall have a contractual relationship with the manufacturer of the equipment installed on the project. Both the manufacturer and Telecommunications Contractor are responsible for the final warranty and certification of the application assurance.
1.2.3 All work shall be performed and supervised by technicians who are fully trained and qualified by the manufacturer to install and test their products. Training shall be ISO 9002 quality approved standard courses. The Telecommunication Contractor shall employ the services of a Registered Communication Distribution Designer, who has current RCDD membership with BICSI, for this project.
1.2.4 In the event that subcontractors are used for any portion of the work or technical support, the Telecommunications Contractor shall bear complete responsibility for the installation, and any corrective action required, for

work performed by subcontractors.

1.3 SYSTEM CERTIFICATION

1.3.1 All cabling, termination hardware, and patch cables shall be ISO 9001 certified and ensure end-to-end transmission requirements for 100 BaseT Category 6 operation, as well as 1000 Mbps Gigabit Ethernet, Twisted Pair Physical Media Dependent (TP-PMD), 155.5 Mbps ATM, 622 Mbps ATM, and video (both baseband and broadband) applications.

1.3.2 Acceptable systems shall be covered by a two-part certification program provided by the manufacturer and his certified vendor. The manufacturer shall administer a follow on program through the Telecommunications Contractor to provide support and service to the Owner. The two parts of the certification program consist of:

1.3.2.1 An assurance program which provides that the certified system will support the applications for which it is designed, for the lifetime of the certified system.

1.3.2.2 A certification program which provides for a fifteen (15) year warranty on all products within the certified system.

1.3.2.3 In the event that the certified system ceases to support the certified application(s), whether at the time of cutover, during normal use, or when upgrading, both the manufacturer and the Telecommunications Contractor shall commit to prompt implementation of corrective action.

1.3.2.4 Documentation proving the cabling system's compliance to the End to End Link Performance recommendations, as listed in Annex E of ANSI/EIA/TIA 568B, shall be provided prior to the structured cabling system being installed.

1.4 SHOP DRAWINGS

1.4.1 Submit shop drawings in accordance with Section 26 01 20.

1.4.2 Include:

1.4.2.1 Manufacturer's technical documentation on all devices used in structured cabling system.

1.5 OPERATING AND MAINTENANCE MANUALS

1.5.1 Provide documentation for inclusion in operating and maintenance manuals specified in Section 26 01 20.

1.5.2 Include:

1.5.2.1 Manufacturer supplied end user's manual, describing the essential system elements and end user's responsibility for maintaining the integrity of the cabling system. This manual shall include as a minimum:

1.5.2.1.1 Guidelines for system expansion and modification.

1.5.2.1.2 Labelling.

1.5.2.1.3 Record keeping.

1.5.2.2 Manufacturer supplied application guidelines for required applications.

1.5.2.3 Test results; Test prinout

1.5.2.4 System certification documentation.

## 1.6 RECORD DRAWINGS

1.6 .1 Submit record drawings, in accordance with Section 26 01 20, to Departmental Representative at completion of project.

1.6.2 Record on one set of white prints, all of the structured cable drops, all changes during construction, and other pertinent details. Indicate label name for each outlet, using numbering system employed on the project.

## 1.7 DESCRIPTION OF WORK

1.7.1 Contractor shall supply and install a complete telecommunications structured cabling system that is based on a physical star wiring topology and shall be designed in accordance with, and supported by, a manufacturer's backed warranty certification as specified above.

1.7.2 The structured cabling system shall conform to the standards listed in 1.1 above, and composed of the following interdependent sub-systems:

1.7.2.1 MC: Main Cross-connect system

1.7.2.2 IC: Intermediate Cross-connect system

1.7.2.3 WA: Work Area - telecommunications outlet/connector, associated cords and adapters

1.7.2.4 HC: Horizontal Cross-connect system - located in the telecommunications closets (TC)

1.7.2.5 A: Backbone cables between MC and HC

1.7.2.6 B: Backbone cables between IC and HC

1.7.2.7 C: Backbone cables between MC and IC

1.7.2.8 D: Horizontal cables between HC and WA

1.7.3 Physical spaces which house structured cabling components comprise the following:

1.7.3.1 TC: Telecommunication Closet - primary function for termination of HC system, but may contain IC or MC systems

1.7.3.2 ER: Equipment Room - functions as a TC with additional capability of housing network trunk/auxiliary terminations
1.7.3.3 EF: Entrance Facility - consists of cables, connecting hardware and protection devices to connect to outside service facilities

1.8 DISTANCE LIMITATIONS

1.8.1 Structured cabling shall conform to CSA T529 standards for distance limitation. Telecommunications Contractor shall examine the drawings and ensure that distance limitations are not exceeded, taking into account length of patch cables and service loops. Advise the Departmental Repesentative during time of tender of any runs that may exceed distance limitations.
1.8.2 Cabling system distances shall not exceed the following:

| | Sub-system Listed Above | | | |
|---|---|---|---|---|
| | A | B | C | D |
| UTP Copper Voice | 800m | 500m | 300m | 90m |
| UTP Copper Data | 90m* | 90m* | 90m* | 90m |
| Multimode Fiber | 2000m | 500m | 1500m | 90m |
| Single Mode Fiber | 3000m | 500m | 2500m | 90m |

(*) Asterisk indicates distance between active devices for applications whose spectral bandwidth exceeds 5 MHz.

1.8.3 Total length of patch cables and cross connect jumpers shall not exceed 10 m.
1.8.4 Patch cables or cross connect jumpers at the horizontal cross connect (HC) shall not exceed 6 m.
1.8.5 A 3 m allowance is assumed for patch cables which connect equipment at the work area (WA). This may be exceeded only where the total length of patch cables and cross connect jumpers does not exceed 10 m.

## 2. Products

2.1 VOICE AND DATA HORIZONTAL CABLING

2.1.1 UTP: to CSA T529 for Category 6 operation, with the following physical and transmission characteristics:

2.1.1.1 Physical characteristics:
2.1.1.1.1 Conductors: four pair, No. 24 AWG, thermoplastic insulated solid copper wire.

2.1.1.1.2 Twists: pairs variably twisted relative to one another, with a minimum of 29 twists per m per pair.
2.1.1.1.3 Cable size: maximum outside diameter of 6.4 mm.
2.1.1.1.4 Breaking strength: 40 kg at -20EC, without insulation or jacket cracking.
2.1.1.1.5 Colour coding of pairs: tracer coloured white paired with each of blue, orange, green, and brown.
2.1.1.1.6 Colour coding of jacket: use two colours for voice, data.
2.1.1.1.7 Fire rating: plenum rated overall jacket, FT-4 compliant.

2.1.2 Transmission characteristics:

2.1.2.1 DC resistance: less than 94 ohms/km, with an unbalance between conductors in a pair of 5% maximum.
2.1.2.2 Mutual capacitance of any one pair: maximum of 46 pF/m at 1 MHz.
2.1.2.3 Characteristic impedance: 100 ohms +/- 15%.
2.1.2.4 Maximum attenuation worst pair: equal to or less than 75 dB/1000 m at 16 MHz, 220 dB/1000 m at 100 MHz.
2.1.2.5 NEXT coupling loss between pairs: equal to or greater than 144 dB/1000 m at 16 MHz, 105 dB/1000 m at 100 MHz.

## 2.2 PATCH CABLES

2.2.1 All patch cables shall match installed cables physical and transmission characteristics, and as follows:

2.2.1.1 UTP type:

2.2.1.1.1 Utilize stranded, not solid, conductors.
2.2.1.1.2 Terminated with 110 and/or modular 8-pin modular connectors.
2.2.1.1.3 Built in exclusion features to prevent accidental polarity reversals and split pairs.

2.2.2 Patch cables shall be pre-manufactured and pre-tested, utilizing a snagless design. Generic patch cables are not acceptable.
2.2.3 Provide patch cables for cross connecting between patch panels and from patch panels to hubs. The quantity of patch cables for the cross connect between the panels shall be at least the same as the number of ports on horizontal patch panels. The quantity of patch cables for connection between hubs and the patch panel shall be at least the same as the number of slots available on the hubs.
2.2.4 Provide one patch cable for every second workstation outlet and each corresponding patch panel outlet.
2.2.5 Provide patch cables according to the following schedule:
2.2.5.1 Cross connect patch cables in closets: 2 m in length.
2.2.5.2 Patch cables at workstations:
2.2.5.2.1 50% shall be 2 m in length.
2.2.5.2.2 30% shall be 3 m in length.
2.2.5.2.3 10% shall be 4 m in length.
2.2.5.2.4 10% shall be 5 m in length.

2.3 TERMINAL CONNECTIONS - UTP

2.3.1 Communication outlet connectors, UTP:

2.3.1.1 Copper-based inserts: to CSA T529.

2.3.1.2 Termination via fixed or removable gas-tight insulation displacement connector (IDC), with hinged or separate buffer cap.

2.3.1.3 Connection of removable IDCs via 8-position edge connector plated with minimum 40 microns of nickel, capable of minimum 250 insertion/withdrawal cycles.

2.3.1.4 Connection of removable IDCs via 8-pin header connector, pins minimum

2.3.1.5 1.4 mm square, maximum 8.9 N engagement force and minimum 2.25 N disengagement force.

2.3.1.6 8-position connector, with copper-based staggered contacts with 50 to 100 microns of nickel overlay and uniformly coated with 50 microns of gold overlay, capable of minimum of 200 insertion and withdrawal cycles.

2.3.1.7 Minimum contact force 1.1 N per contact. Minimum plug retention force 76 N.

2.3.1.8 Conductors separated and aligned internally by comb structure.

2.3.1.9 Compatible with 100 ohm UTP cable, rated for same data transmission speed as cable used.

2.3.1.10 Maximum attenuation worst pair: equal to or less than 0.2 dB at 16 MHz, 0.4 dB at 100 MHz.

2.3.1.11 NEXT coupling loss between pairs: equal to or greater than 56 dB at 16 MHz, 40 dB at 100 MHz.

2.3.1.12 Connector and faceplate to be constructed of high-impact fire retardant thermoplastic, colour to match colour of receptacles specified in Section 16141, CAN/CSA T528 compliant. Outlet shall provide sufficient density to support up to 6 connectors per single gang outlet, and 9 connectors per two gang outlet.

2.3.2 Modular connectors, UTP:

2.3.2.1 Matching types and minimum specifications as for outlet connectors specified above.

2.3.2.2 Long body type.

2.3.2.3 Suitable for No. 24 AWG solid or stranded conductor as required.

2.3.2.4 Tool-stuffed with IDC contacts and plier latched cap.

2.4 PATCH PANELS

2.4.1 Floor mounted rack:

2.4.1.1 Free-standing 4-leg style, open body fabricated of 2.5 mm minimum painted steel, unless otherwise approved.

2.4.1.2 Equipment mounting rails fabricated of 2.prio-0 mm minimum steel, drilled and tapped both sides for No. 12 screws.

2.4.1.3 Grounding lug.
2.4.1.4 Designed to accommodate standard EIA standard 483 mm wide panels.
2.4.1.5 Receptacle bar with 3 m power cord, minimum 10 outlets, complete with surge suppression protection.

2.4.2 Patch panels - UTP:
2.4.2.1 483 mm wide panels, mounted in rack type specified above, for cross connection of horizontal and backbone cabling, with outlets having similar specifications to terminal connection hardware specified above.
2.4.2.2 Wiring blocks shall be constructed of fire retardant moulded plastic blocks consisting of horizontal index strips for termination of 25 pairs of conductors each, accommodating No. 24 AWG conductors without untwisting of pairs or more than 75 mm of unsheathing. A series of fanning blocks shall be located on each side of the block for dressing the cable pairs on the adjacent index strips.
2.4.2.3 Termination blocks shall accommodate over 500 repeated insertions without incurring permanent deformation, suitable for voice, data, and building service applications.
2.4.2.4 Patch panels to have the same number of ports as the total horizontal outlets, plus 10% additional for future.

2.5 MANUFACTURERS

2.5.1 All cables utilized on project shall be from the same manufacturer.

2.5.2 All termination hardware and patch panels utilized on project shall be from the same manufacturer.

2.5.3 Cables and termination hardware may be of different manufacture, provided manufacturer of termination hardware has a contractual agreement with cable manufacturer to provide and end-to-end certified solution.

2.5.4 Acceptable manufacturers:

2.5.4.1 UTP cable: Alcatel, AMP of Canada, Belden, Avaya (Lucent Technologies), NORDX/CDT.
2.5.4.2 Termination hardware: AMP of Canada, Hubbell, Krone, Avaya (Lucent Technologies), NORDX/CDT.

## 3. Execution

### 3.1 CABLE INSTALLATION

3.1.1 Install structured cabling in conduit, cable trays, wireways, and surface raceways as indicated on drawings, and as further specified.

3.1.2 Horizontal cabling may not be run open in free air. All cabling shall be completely installed in conduit, raceways or cable tray.

3.1.3 Do not exceed manufacturer's maximum pulling force recommendations.

3.1.4 Maintain not less than minimum bend radius for all cables.

3.1.5 Ensure cables are not squeezed, flattened, or crimped at any point along entire run.

3.1.6 Tie wrap cables neatly into logical bundles in cable-trays, at 600 mm intervals. Ensure tie wraps do not crimp or otherwise damage cables.

3.1.7 No splices or intermediate terminations in UTP cable runs are allowed. Cables shall terminate in cross connect patch panels or workstation outlets only.

3.1.8 Allow 1 m of slack cable on each run at workstation end, and 3 m of slack cable on each run at the patch panel end.

3.1.9 Install cables in slotted PVC raceway in communication rooms, and fan individual cables to applicable patch panels in neat, logical manner. Slotted PVC raceway to conform to FT-4 flame spread requirements, have adhesive backing, be multi-channel capable, and have a minimum 25 mm bend radius on corner fittings.

3.1.10 Provide all necessary wire management accessories for installing all cables inside the management panels. Install cable management panels, cable storage/trough/shelf between every two patch panels to facilitate the installation of patch cables.

3.1.11 After all cabling is installed, provide appropriate fire stopping in openings through fire rated walls. Fire stop material shall be of a type that permits installation of additional cabling in the future, with fire stop material being readily reinstalled. Fire stop material to conform to requirements indicated in Section 16010.

## 3.2 CONNECTORS

3.2.1 Use tooling specific to connector types and cable in use.

3.2.2 Ensure that connector's strain relief provisions are used. Strip jackets only amount required.

3.2.3 Maintain pair twists. The amount of untwisting to facilitate installation of connector or termination shall not exceed 10 mm.

3.2.4 Pairs within a cable shall not be split, and all pairs must be terminated.

3.2.5 UTP connection configuration shall be in accordance with T568A pinout for data terminations.

3.2.6 UTP connection configuration shall be in accordance with USOC pinout for voice terminations.

3.2.7 Insert blank snap-in cover in all unused outlets to prevent introduction of dust.

## 3.3 PATCH PANELS

3.3.1 Install rack in telecommunication room, and mount securely to floor

3.3.2 Install patch panels into racks, with as many screws as there are mounting holes or slots in panels.

3.3.3 Attach horizontal wiring in an ordered fashion following sequential numbering of outlets.

3.3.4 Provide necessary strain relief and cable support brackets, and install cables utilizing such devices.

3.4 GROUNDING

3.4.1 Perform all grounding in accordance with CSA T527, C.E.C., Section 26, and the requirements of the manufacturer.

3.4.2 Provide minimum insulated No. 6 AWG grounding wire in each TC, ER, and EF. Maximum resistance to ground shall be 5 ohms.

3.4.3 Ground all racks. Use grounding bushing, solderless lug, clamp, or cup washer and screw.

3.4.4 Install ground conductors such that neither they nor structured cabling interferes with one another in regards to future servicing of patch panel rear end connections.

3.4.5 Protect grounding conductors from injury.

3.5 IDENTIFICATION

3.5.1 Label each end of each cable and each cable termination in accordance with CAN/CSA T528 standards and Section 26 01 10 using prenumbered self-adhesive labels and colour-coded inserts. Coordinate numbering and colour coding systems with Owner.

3.6 FIELD QUALITY CONTROL

3.6.1 Perform testing in accordance with Section 26 01 35

3.6.2 Final testing shall be carried out after substantial completion of project, testing all runs, including patch cables with the modular interface components (plug and jack connectors) in a mated state.

3.6.3 Copper media:

3.6.3.1 Test for the following, in accordance with EIA/TIA TSB 67:
3.6.3.1.1 Continuity.
3.6.3.1.2 Pair placement and polarity.
3.6.3.1.3 DC resistance.

3.6.3.1.4 Structural return loss.
3.6.3.1.5 Characteristics at 100 MHz 155 MHz:
- attenuation
- mutual capacitance
- NEXT
- Powersum NEXT.

3.6.3.1.6 Run length.

3.6.3.2 Prior to recording results, compare readings to predicted values based on cable specification and run length, using connector and patch cable losses as part of predicted value. Retest runs with:
3.6.3.2.1 Resistance and capacitance readings more than 10% above or below predicted values.
3.6.3.2.2 NEXT values 5 dB lower than predicted values.
3.6.3.2.3 Attenuation values 2 dB higher than predicted values.

3.6.3.3 Reconnect or reinstall and retest as necessary to correct excessive variations.
3.6.3.4 Test equipment shall be a Level II bi-directional Category 6 tester, from one of the following:
3.6.3.4.1 Fluke.
3.6.3.4.2 MicroTest Penta.
3.6.3.4.3 Wavetek.

3.6.4 Verify labelling of all conductors at all termination points. Verify labelling of all termination hardware.

3.6.5 Submit one copy of test report to Departmental Representative, and three copies to Owner. Report shall consist of one cable run test per page, be printed on standard 215 mm x 280 paper, and also provided electronically in form requested by Owner.

3.6.6 Provide written documentation confirming that transmission performance testing and inspection have been completed and that all cable runs have passed. Document that all failures have been corrected, and retested successfully.

END OF SECTION

# 1 GENERAL

## 1.01 REFERENCE STANDARDS

.1 Canadian Wood Council
.1 Wood Design Manual - 2005.

.2 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2003 edition.

.3 National Building Code (2015)

.4 Good Building Practice for Northern Facilities -4th Ed.

discard of adsorbent material to sanitary landfill.

# 2 PRODUCTS

## 2.01 MATERIALS

.1 Timber: use timber graded and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board of CSA.
.1 Application: Cribbed Footings
.2 Species: SPF
.3 Grade: #2.
.4 Pressure Treated

.2 Type 1 - 20mm Minus Granular fill below: The gravel base course should be compacted to a uniform dry Density of 100 percent of SPMDD within ± 2% of the OMC. A recommended typical gradation for stable granular material, for fill and backfill.

| Property | ASTM Test Method | Type 2 (Sub-Base) | Type 1 (Base) | Select Subgrade |
|---|---|---|---|---|
| Gradation (sieve/% passing) | – | – | – | – |
| 150 mm | C136 | – | – | 100 |
| 75.0 mm | C136 | 100 | – | – |
| 37.5 mm | C136 | – | – | – |
| 25.0 mm | C136 | 50 – 100 | 100 | 50 – 100 |
| 19.0 mm | C136 | – | 75 – 100 | – |
| 9.5 mm | C136 | – | 50 – 85 | – |
| 4.75 mm | C136 | 20 – 55 | 35 – 65 | 20 – 100 |
| 2.0 mm | C136 | – | 25 – 50 | – |
| 0.425 mm | C136 | 5 – 35 | 15 – 30 | – |
| 0.300 mm | C136 | – | – | 5 – 95 |
| 0.150 mm | C136 | – | – | 2 – 65 |
| 0.075 mm | C117 | 0 – 8 | 5 – 8 | 0 – 25 |

**END OF SECTION**